DOCUMENT RESUME

ED 031 867 40 EC 004 342

By-Newland, T. Ernest
The Blind Learning Aptitude Test.
Illinois Univ., Urbana.
Spons Agency-Office of Education (DHEW), Washington, D.C. Bureau of Research.
Bureau No-BR-6-1928
Pub Date Feb 69
Grant-OEG-3-6-061928-1558
Note-126p.
EDRS Price MF-$0.50 HC-$6.40
Descriptors-Achievement Tests, Age Differences, *Aptitude Tests, *Exceptional Child Research, Geographic Location, Individual Tests, Intelligence Tests, Racial Differences, Research Methodology, Sampling, Sex Differences, *Tactile Adaptation, Tactual Perception, Test Construction, Testing, Test Reliability, *Tests, Test Validity, *Visually Handicapped
Identifiers-BLAT, Blind Learning Aptitude Test

A Blind Learning Aptitude Test (BLAT) was developed on the basis of sense of touch rather than on conventional experience, fine sensory discrimination, or verbal competency. From a pool of about 350 items, most of them used in testing intelligence in the sighted, a pool of 94 was selected and embossed after the manner of braille. A residual pool of 49 test and 12 training items was selected through the responses of some 500 blind children. Normative data were gathered on the responses of 961 subjects. Analyses of the data indicated the following correlations for the BLAT: internal consistency, .934; test-retest reliability over 7 months, .865; and Hayes Binet mental ages, and Wechsler Intelligence Scale for Children verbal ages, .89 for the 420 children for whom preceeding scores were available. Although the BLAT was found to lose discriminative power at or near the 12-year level, it was suggested as being more valuable than the Hayes Binet or the Wechsler for younger children since it tests process rather than product behavior. (JD)

ED031867

BR-6-1928
PA-40

PA-40 OE-BR

FINAL REPORT
Project No. 6-1928
Grant No. OEG-3-6-061928-1558

THE BLIND LEARNING APTITUDE TEST

February 1969

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

EC004342E

FINAL REPORT
Project No. 6-1928
Grant No. OEG-3-6-061928-1558

THE BLIND LEARNING APTITUDE TEST

T. Ernest Newland

University of Illinois

Urbana, Illinois

February 1969

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TABLE OF CONTENTS

Page No.

1. The Standardization - Pre-Project 2
    - 1.1 General Review of Initial Testing of Blind 2
    - 1.2 Early Felt Need for BLAT-Like Approach 9
    - 1.3 Support for Research on BLAT 12
    - 1.4 Pre-Project Work on BLAT 15
        - 1.41 Rationale for a Test for a Specific Population 15
        - 1.42 The Validation Problem 18
        - 1.43 Rationale for the BLAT Items 20
        - 1.44 Development of Test Materials 21
        - 1.45 Development of Procedure for Administering BLAT 26
        - 1.46 Problems of Data Collection 27
            - 1.461 The Population Problem 27
            - 1.462 The "Blindness" Definition Problem . . 28
            - 1.463 The Age Sample Problem 29
            - 1.464 The Background Information Problem . . 30
            - 1.465 Controlled Collection of BLAT Data . . 30

2. The Project Phase 32
    - 2.1 Collection of Data 32
        - 2.11 Overview 32
        - 2.12 BLAT 32
        - 2.13 Hayes-Binet and WISC 32
        - 2.14 Stanford Achievement Test 35
            - 2.141 Sample Bias in Achievement Testing . . 36

Page No.

2.15 BLAT Retesting 40

2.2 Characteristics of Total Standardization Population . . 40

2.21 The Total Standardization Population 40

2.22 Representativeness of Standardization Population 40

2.221 Socio-Economic Status and Race 40

2.222 Race-Sex Distribution 43

2.223 Geographic Distribution 45

2.3 Standardization Data 47

2.31 Learning Age and Learning Quotient Equivalents 47

2.32 Sub-Analyses 53

2.321 By Sex 53

2.322 By Race 53

2.323 By Kind of School 60

2.324 By Geographic Area 60

2.325 By Southern School and Achievement . 60

2.33 Reliability 66

2.34 Factor Analysis of BLAT 70

2.35 BLAT Correlations with Other Measures 70

2.351 With Hayes-Binet and WISC 70

2.352 With Stanford Achievement Results . . 71

3. Summary 74

4. Further Research Possibilities 77

5. Bibliography 80

6. Appendix Page No.

A. Sources of BLAT Items 85

B. Background Information Form 86

C. BLAT Factor Analysis 87

D. Manual 88

E. Test Record Sheet 101

F. Plates 103

* * * * *

Table 2.13 Numbers of Pre-Project Pupils, by Age, Whose Hayes-Binet & WISC Verbal Scores Were Used 34

Table 2.14 Numbers of Children, by Schools, on Whom Project Test Scores Were Obtained 37

Table 2.141 Chronological Age & Aptitude Test Data on Children With and Without Achievement Test Results, by Age Groupings, by State and by Total 39

Table 2.21A Total Functionally Blind Standardization Population by Age, Type of School, Sex, and Race 41

Table 2.21B Summary Table of Functionally Blind by Age, Sex and Race 42

Table 2.222A Percentages of Blind U.S. and BLAT Populations, Aged 5-19, by Sex and Race 43

Table 2.221 Occupational Levels of Subjects' Major Breadwinners for White, Non-White, and Total BLAT Populations 44

Table 2.222B Racial Representativeness of the Standardization Population 45

Table 2.223 Percentages in Regions, in Combined Sample Area, and in Total U.S. Blind Child Population Represented in Standardization Population . 46

Page No.

Table 2.31A Learning Aptitude Age Equivalents for BLAT Scores With Standard Errors of Measurement 48

Table 2.31B BLAT Norming Statistics 49

Table 2.31C BLAT Learning Quotients by Half-Years 52

Table 2.31D BLAT Raw Scores, by Age, at 15-Point IQ Intervals 51

Table 2.321 Means & Sigmas of BLAT Scores, Hayes-Binet Mental Ages (in months), and WISC Test Ages (in months) by Age and Sex 54

Table 2.322A BLAT Means, Standard Deviations, and Ns for Total Standardization Population and for Southern Population, for White and Non-White Subjects, Ages 7 through 17 58

Table 2.322B Hayes-Binet and WISC Verbal Average Ages, by Age Level, and by White and Non-White Subjects, in Southern Population 59

Table 2.323 Means, Sigmas, and Numbers of Subjects, by Chronological Age, on BLAT, Hayes-Binet, and WISC (Verbal) for Residential and Day School Populations 61

Table 2.325A Average Data for Those Taking Achievement Tests 64

Table 2.325B Average Data for Those Taking Achievement Tests by Chronological Age Sub-Groups 65

Table 2.33A Product Moment Correlations Between BLAT Test and Retest Scores with Stanford Achievement Test Scores 69

Table 2.33B BLAT Median Retest Score Gains by Chronological Age 69

Table 2.351A Correlations Between Learning Aptitude Measures on Pre-Project, Project, and Total Populations 70

Table 2.351B Correlations Between Learning Aptitude Measures on Southern School Populations 71

Table 2.352A Correlations Between Learning Aptitude Measures and Stanford Achievement Test Results, by Schools 72

Page No.

Table 2.352B Product-Moment Correlations Between Learning Aptitude Measures & Stanford Achievement Test Results for the Southern Schools Combined 72

Table 2.352C Product-Moment Correlations Between Learning Aptitude Measures & Stanford Achievement Test Results for the Three Southern Schools . . 73

* * * * *

Figure 2.31B BLAT Means & Standard Deviations, by Age . 50

Figure 2.321A BLAT Means & "Sigma Paths" by Age and by Sex (Total Standardization Population) 55

Figure 2.321B Learning Aptitude Means Across Age 56

Figure 2.322 BLAT Means, by Age, for White & Non-White Subjects 57

Figure 2.323 Learning Aptitude Test Score Averages, Ages 7 through 17, for Residential and Day School Subjects 62

Figure 2.324 BLAT Means, Ages 7 through 17, for Geographic Sub-Samples 63

OVERVIEW OF THE TOTAL REPORT

This report consists of two major parts. Introductory to the first is a brief review of work relating to the testing of "intelligence" of the blind - particularly of blind children, a brief description of the background out of which grew the belief that a different approach to this important problem was needed, a gross review of research support obtained for work on the total undertaking, and a review of work done, starting in 1952, on the Blind Learning Aptitude Test (BLAT) prior to the request funded, in 1966, by the U.S. Office of Education for the formal standardization of BLAT. The second major portion includes information on the data collected under this project, the characteristics of the total standardization population, including both the pre-project population and the project population, and the standardization statistics for the total population.

A secondary, but quite interesting, section is devoted to findings growing out of and a consideration of problems related to the whole undertaking. Included here are data on learning aptitude test performances of residential and day school blind children, data on racial and regional differences, and information bearing upon the adequacy, from a research point of view, of the data on the achievement testing.

After the summary section there is a much more challenging section on problems encountered which suggest the needs for both further efforts in psychoeducational procedures with blind children and for further research in this area. Included in the appendix are the manual (the one in English, although one in Spanish is available) and the plates showing the BLAT items. Anyone who may wish to make further analyses of the data used in this study, or who may wish to make other analyses of them, may obtain a copy of all the quantified data from the author.

In case this report strikes the reader as more detailed in nature than generally is the case, this has been done intentionally. So often the research report writer so distills the description of his work that replication is not possible, rationale, conditions and problems are only vaguely comprehended by the less-informed reader, and hasty and often misleading conclusions or inferences are thereby invited.

No sensitivity is reflected herein to that almost inevitable question asked by sighted persons in regard to BLAT: "How do sighted individuals (blindfolded, of course) respond to the items?" While the results of the exploration of this matter may be contributive to the problem area of perception, in the broader psychological sense, it is not regarded as directly relevant to the focus of this study - the standardization of a test for blind children. Blindfolded sighted S's have been observed reacting to BLAT items. In doing so, they tend to take one-third to one-half more time which leads to inferences regarding their less-effective tactual discrimination (on many of the items), differences in procedures in defining the input (or stimulus), the field, and the like. The potential results of such exploration were regarded as not being basically contributive to the task at hand.

The collection of the data for the "project period", their analyses, and the preparation of this report were made possible by the U.S. Office of Education, Grant Number 1558, Project Number 6-1928. The author, of course, takes sole responsibility for the findings and observations in this report.

1. STANDARDIZATION - PRE-PROJECT

1.1 General Review of "Intelligence" Testing of the Blind

Any review of the endeavors to measure the "intelligence" of the blind necessitates the consideration of two areas of activity which must be regarded as largely, though not entirely, separable. Although a commonality in theory may exist between such testing of adults and children, there are important differences between the work in these two areas, particularly as regards the nature of appropriate criteria.

The stated or implied criteria appropriate to the testing of the intelligence of the adult blind are either so molar that validation is perceived in terms of some idea of an "overall intelligence" which may be involved, in some pervasive way, in any of a number of adult activities, or so differentiated that it is necessary to proceed in terms of specific "intelligences", or aptitudes. Attempts to develop intelligence tests for the adult blind suggest, on the part of those making such attempts, an amorphous sensitivity to something of the order of "general intelligence" - a kind of potential which could play some unspecified role in any of the varied kinds of things which the adult blind may be expected to do - from teaching and other professional involvement, to operating stands, working in a factory, being a musician or piano tuner, or to working in a sheltered workshop. Common sense suggests the merit of thinking in terms of such "general intelligence", but clear-cut research neither affirms nor refutes such a presumption. The position taken here is that, with such wide differences in the criteria - the widely differing kinds of behavior to be predicted - a nebulousness in regard to the kind or kinds of behavior to be sampled in order to make such predictions is at least understandable or tolerable, if not necessary.

On the other hand, the criterion in the case of blind children is relatively very much simpler, considerably more homogeneous in nature. The largest single kind of behavior to be predicted in the case of these children is, in psychological terms, their performance in the acquisition and use of symbols. Put more specifically in terms of educational performance, the behavior to be predicted is that which is involved in communication - comprehending in hearing and talking, comprehending in reading history, literature, arithmetic, geography, and the like. The fact that the act of reading for these kinds of comprehension has to be done by the blind by means of braille complicates the process, but does not change it fundamentally in the psychological sense. Hence, the term "learning aptitude test" is preferable to "intelligence test" when one is thinking in terms of children in school situations. It is quite likely, of course, that this component plays a large part in the commonality across rather highly varied adult occupations which makes relevant and somewhat useful the "general intelligence" tests for adults. But these two discernibly different kinds of criteria cannot be regarded as constituting a clear dichotomy. There is, rather, a criterion continuum, one end of which involves clearly predominantly the symbol-acquisition-and-use kind of behavior in the case of children, and the other end of which involves the rather grossly diffuse group of behaviors in the case of adults.

The behavioral expectations for all children at the elementary school level necessitates thinking heavily in terms of academic learning aptitude, recognizing, of course, that emotional and physical factors also may be operating. As children progress up the educational ladder, say to the high school level, the diversification of learning demands increases. Not including the fact that activities such as physical education and vocal and instrumental music tend to become formally recognized as school subjects at the secondary level, the variety of other learning behaviors here has increased from the relatively few at the elementary level to include also verbal learning demands in areas such as shop work, commercial courses, and home economics. Even the verbal learning demands in quantitative areas can be different from those in literature and social studies. The intentionally oversimplified symbol acquisition potential which figures so largely in predicting educational achievement at the elementary level continues to play an important, though decreasing, role at the secondary level, as is shown in the decreased magnitudes of the correlations between measured "intelligence" and achievement in academic areas at the secondary level. As the role played by such a single type of measure of potential decreases, special aptitude measures necessarily have to be utilized increasingly.

Intentionally excluded from consideration here are such positive or (more often) negative contributing factors as the physical condition and emotionality of the children. This ignoring of such factors here is in no way intended to imply that they may not be significant variables. However, they are not being measured, even though they very well may affect both the measures of learning aptitude and the effectiveness with which that aptitude may operate. As in any attempt to measure learning aptitude, whether with blind children or others, learning aptitude is reflected through performance on the device or devices used. The extent to which extenuating, contaminating, or facilitative factors may have been operative is (or should be) reflected in the clinical inference(s) which the examiner draws on the basis of his full knowledge of the child whom he is examining.

The data used in this study have been psychometrically obtained rather than psychologically (clinically) arrived at. The children were administered the learning aptitude devices by standardized procedures by adequately trained testers and the scores which they earned under such conditions were recorded. No inferences were made on the basis of qualitative evaluations and no adjustments were made in the direction of any clinically perceived "true" scores. Research based upon such (possibly) refined psychological data is yet to be done; such research could throw valuable light upon whether the use of such clinically refined measures is justified and upon whether more significant findings than by means of the more frequently encountered psychometric data are possible.

The BLAT, the standardization of which is described here, is, then, intended for blind children. Just where blind individuals cease being reported as "children" and come to be regarded as "adults" is an elusive point or zone. Since the "learning aptitude" in BLAT is presumed to be related to learning in school, BLAT was regarded as potentially valuable, particularly for blind children at the elementary school level and somewhat, perhaps, at the secondary school level. Therefore, a review of endeavors to develop "intelligence" tests only for use with blind children is believed to be contributory to an understanding of the psychometric-psychological milieu out of which BLAT has emerged.

> "Early efforts to develop intelligence tests for the blind consisted essentially of attempting to adapt, for (verbal and) tactual use with the blind, certain (verbal and) visual tests which had been standardized on non-handicapped populations. In 1914, R.B. Irwin worked with Goddard in adapting his Vineland Binet for use with the blind. W.B. Drummond, in a January, 1915, issue of the British journal, The Teacher of the Blind, suggested adapting the Binet-Simon tests for use with the blind, although it was not until 1920 that he actively explored the possibility of the use of an adaptation of the Goddard-Irwin tests which T.H. Haines had made in Ohio. In 1916, Haines published results on the blind which he had obtained also by means of an adaptation of the Yerkes Point Scale of the Binet. The testing done by means of such adaptations, largely by Samuel P. Hayes and Miss K. Roese at Perkins, Overbrook, and Batavia, provided a rich background out of which subsequent testing adaptation efforts were to come.
>
> "The stimulus of the group testing needs of World War I contributed to Hayes' 1919 adaptation of the Pressey Group Point Scale for use with the blind. In Europe, Drummond reported in 1920 on his use of the Haines adaptation, and Burkler reported in 1918 and 1921 on his use of Bobertag's adaptation of the Binet. Hayes' 1923 'scissors and paste' adaptation of the 1917 Binet was heavily contributive both statistically and experientially to his 1930 revision. This, in turn, was succeeded by his 1943 adaptation of the 1937 Revised Stanford Binet. Other adaptations were being made: Results on the use of the Otis Group Test of Mental Ability with a group of blind subjects

> were reported by Ruth Sargent in 1931, and this may have been the same test by means of which B.F. Holland obtained some of the data he reported in 1936. Some three years later, E.N. Fortner reported on results obtained by means of the Kuhlmann-Anderson, and Brown and Davidson reported results obtained by means of the Institute for Juvenile Research Test for visually handicapped children. In 1942, Hayes published an adaptation of the Wechsler-Bellevue, and Pintner reported on attempts to adapt the 1937 Binet by means of photostatically enlarging the visual materials." (Newland, 1961)

Any consideration of the testing of the learning aptitude ("intelligence") and educational achievement of blind children would be grossly inadequate if there were not reviewed, more in detail than the overview presented above, the early work by, and as a result of the influence of, Hayes. Current literature on blind children reflects little concern with these areas of measurement. Either that which is done is taken for granted and not regarded as having research communication value or little, if any, effort is being expended in this important direction. One suspects the latter to be the condition that maintains.

Partly because no one appears to have pulled together, in some sort of historical perspective, information on the early efforts of Hayes and his students in this area, and partly because some of the early findings have some relevance to this undertaking, the following summary is included here.

As early as 1918, Hayes was urging the use of achievement and intelligence tests in schools for the blind, pointing out the feasibility of using, for instance, the Trabue Completion Test, and supplying directions for its use. In 1921, he issued, from Overbrook, a manual for the guidance of teachers under the title, "Self-Surveys in Schools for the Blind." In this, he supplied the directions for giving, scoring, and interpreting some 23 tests: Ten of the subtests of the Pressey Group Point Scale for Measuring General Intelligence; the Courtis Practice Tests in Arithmetic; the Nassau County Supplement to the Hillegas Scale for Measuring Quality of English Composition; the Starch Test of Comprehension of Silent Reading; the Trabue Language Scale; the Starch Language Grammatical Usage Test; the early Terman Vocabulary Test; the Harlan Test of Information in American History; the Starch Dictionary Spelling Test; the Ayers Spelling Test; the Hahn-Lackey Geography Scale; the Courtis Map Test; a rate of writing test (slate and mechanical writers or typewriters); and the Means Word Opposite Test. (Hayes, 1921) As director of research at Overbrook, he issued in 1927 a descriptive report entitled, "Ten Years of Psychological Research in Schools for the Blind," much of which had to do with testing. His 1929 article, "The New Revision of the Binet Intelligence Tests for the Blind," not only provided descriptive information about the test, but also alluded to the comparability of results obtained on blind and sighted children. (The blind earned IQ's 10 points below the sighted, the distribution approximately a normal curve.) (Hayes, 1929)

In 1931, one of his students, Sargent, reported on the use of an adaptation of the Otis Classification Test, Form A, Part II with 210 Overbrook and Perkins pupils in grades 5 through 11 (C.A. 10-4 to 36-8). She found that the IQ's in this device correlated with those on the Irwin-Hayes-Binet .586 (MA's, .55). (1931) Results obtained on 170 blind pupils in grades 4, 5, and 6 by means of the Stevenson Arithmetic Reading Test 1, Form 2 (Problem Analysis) were reported by Merry in 1931. Performances by the blind were found to be comparable to those obtained by the sighted, although it was noted that there were more older children in the classes for the blind. Results obtained on 900 blind children in ten schools for the blind, in 17 achievement areas, provided the basis for an article, "Factors Influencing the School Success of the Blind." (Hayes, 1934) In his 1935 article, "How to Handle Test Results - A Plea for Wider Use of Group Tests," Hayes used results obtained by means of the Otis Classification Test, Part II, to illustrate, among other analyses, his proposal to ascertain an "efficiency" measure by means of dividing the obtained score by the normal score for each child. (Hayes, 1935) His analysis of performances on memory for digits provided the basis of his article, "The Memory of Blind Children," leading to his observation of "no general compensatory superiority in the memory of blind children." (Hayes, 1936, page 74)

In "The Measurement of Educational Achievement in Schools for the Blind," he incorporated revised directions for administering the New Stanford Achievement Test (3rd Revision), which had been adapted for use with the blind. Here, again, he pressed for a greater use of testing: "It is our hope that a considerable number of schools will begin the use of these tests with the help of the accompanying directions." (Hayes, 1937, page 90) Under this stimulus, Abel (1938), reported on "The Educational Achievement of Fifth and Sixth Grade Blind Children" in 12 schools. The 80 fifth graders scored slightly (4 months) above the sighted norms, but the 83 sixth graders averaged 1 year 6 months lower than sighted sixth graders - a condition attributed, at least in part, to the fact that there were so many older sixth graders among the blind. Hayes' 1938 article, "What Do Blind Children Know?", evaluating the findings of two surveys, pointed out that "grade by grade blind children are picking up about as much school information as the seeing, although the presence of more over-age children in the grades suggested 'retardation'". He regarded the retardation as even greater in vocabulary. Again, he recommended a more extended use of achievement testing, reflecting the conviction he expressed in his 1935 article: "In any case, science advises us to face the facts." And again, in 1939, he tried to facilitate the use of tests in schools for the blind in his article, "Practical Hints for Testers", giving helpful suggestions to teachers and listing the intelligence and achievement tests which were available in braille. This same year, his article, "Standard Graduation Examination for Elementary Schools: Adapted for Use in Schools for the Blind", contained directions for administering the Otis-Orleans Graduation Examination for Elementary Schools, Form A.

In her 1939 article, "A Group Intelligence Test in Braille", Fortner reported on the adaptation of the Kuhlmann-Anderson, printed in braille, by the American Printing House for the Blind. The results she obtained on 102 children, in grades 5 through 12, in Oregon, Washington, and Iowa, correlated .567 ± .068 with those obtained on the Hayes-Binet.

Haines' efforts (1916, 1919) to develop a point scale for the blind seem to have had no major impact upon intelligence testing or research during this or any subsequent period. The work of Knotts and Miles (1929), comparing maze-learning ability in the blind and sighted, led to a study by Merry and Merry (1934) of "The Finger Maze as a Supplementary Test of Intelligence for Blind Children", made on 30 residential school children (most of whom were blind before the age of 5; ranging in C.A. from 8 to 16; Hayes-Binet M.A. range 7-4 to 18-0, with a median M.A. of 13-5 and a median IQ of 111), which yielded an r of .61 ± .07 between average time and M.A., but this too, apparently, died aborning.

> "In 1945, I. Winifred Mangan made an English adaptation of the 1937 Binet. Mangan's 1949 doctoral dissertation reports her attempt to create a non-verbal test of intelligence for the blind. Presuming some braille reading ability on the part of the subjects, the test elements reported in the dissertation involved (1) recognition of likenesses; (2) progression in number and/or position of braille cells; (4) a "common factors" function which required the identification of the braille cell common to the first two elements of a test item followed by the addition of that common factor to the next following element; (5) a pattern completion activity involving the identification of a four-cell pattern followed by the completion of a three-cell nucleus in such a way as to make a corresponding type of pattern; and (6) a nine-figure matrix test which involved the use of geometric figures, but with the possible answers designated by braille numbers. Little use of this test appears to have been reported." (Newland, 1961)

The Williams Intelligence Test for Children with Defective Vision was developed and issued by the Institute of Education of the University of Birmingham (England) in 1956. This individual test was intended for use with blind and partially sighted children between 5 and 15 years of age. The materials for this test were taken, with no indicated awareness of the work of Hayes, from a variety of tests already standardized on sighted children - the 1937 Terman-Merrill Binet (largely from Form M), from the Vocabulary test of the Wechsler Intelligence Scale for Children, and from two British tests - Valentine's Intelligence Tests for Children and Burt's Reasoning Tests. Nothing other than the standardization evidence that this test appears to discriminate among the children in the standardization population appears to have been published regarding its validity. (Buros, 1965)

In 1956, Wattron reported the exploratory use of the Kohs block test, with smooth and knurled surfaces with 10 blind boys and 10 blind girls matched by age and sex to sighted S's. Pearson established norms for 4th, 5th, and 6th grade blind children on the School and College Ability Test. Rich developed a tactual form of the 36-item 1956 Raven Program Matrices for use with blind children. Correlations between results on this, for 115 children from 6 to 15 years of age and grade point average, academic rating, and "Braille rating" range from .18 to .39 in contrast to WISC "verbal scores" which correlated .50 to .64 (1963, 1965). Davis, at Perkins, has underway the standardization of the 1960 Binet Intelligence Scale on the blind.

The early attempts to adapt tests originally developed for the sighted for use with the blind were more of a psychometric than a psychoeducational nature. The adapted materials, and the scoring of them, were modified in whatever ways seemed to be needed in order, primarily, to yield distributions of scores which would discriminate across ages and yield distributions that would approach normality (usually IQ's). The extent to which obtained average IQ's of the blind approached or equalled the average for the sighted seemed to be the focus of concern in the early literature on such work. There was considerable additional sensitivity to the comparability of the dispersions of the distributions of IQ's in the blind and sighted groups. While there were some allusions to mental ages of the blind, these were primarily in terms of comparability with sighted M.A.'s, or, in some instances, in terms of their use when matching blind and sighted subjects in experimental studies. The use of M.A. in terms of educational expectancy, per se, appears to have been grossly lacking - a condition not significantly different from present practices even in the case of sighted children. Contributing to this, of course, is the fact that little was known, or still is known, about educational expectancies for blind children in terms of their levels of "mental" development. In a gross sense, however, the facts that the scores earned by blind children on these adapted devices correlated positively - sometimes in the .50's or .60's - with measured educational performance and that the results on the different devices intercorrelated positively encouraged the early workers in this area.

In view of the fact that a comment was made above to the effect that little thinking about the results of learning aptitude tests in terms of the mental levels which they reflected and what these levels might suggest in terms of educational expectations, an observation seems in order regarding the kind of information communicated by the correlation coefficients obtained (usually involving the use of IQ's). A correlation coefficient of, say, .85 between the results on Test A and on Test B can be interpreted in any one of three ways: While the ordering of the S's in the two groups was roughly the same, as reflected by that coefficient; (1) the mental levels of the scores on the two tests may be very much the same; (2) the mental levels of the scores on Test A may be consistently lower than those on Test B; or

(3) the mental levels of the scores on Test A may be consistently higher than those on Test B. Thinking in terms of research on sighted children, since we do not have such research on blind children, if Test A yielded a mental level of, say, four and one-half years and Test B yielded a similar result, both tests would suggest a comparable expectancy of reasonable success in reading readiness work. If, however, one test yielded an M.A. of four and one-half and the other one of five and one-half, or, contrarily, of three and one-half, which of the two tests in these two situations would suggest the more appropriate expectancy? Such a correlation would have considerable statistical or psychometric value but would be psychoeducationally ambiguous. This concern has little relevance to the standardization problem with BLAT at this time but very well could be important if and when test ages on BLAT (or any other test of learning aptitude) were found to be meaningful indications of educational expectancy. The need for research on this will be pointed out at the end of the report.

It is interesting to note, particularly in regard to the contrast in the case of BLAT, that the kinds of behavior samplings in the extant tests were regarded implicitly as appropriate for use with the blind. True, Hayes substituted two sticks of differing lengths for the two printed lines in the Binet; Haines made larger some of the Yerkes Point Scale materials; mazes made of staples in wood were found to be better for the blind than slot mazes; and some vocabulary substitutions were made. (Hayes, in discussing his early efforts with the author, told how his basement was "full" of things he had tinkered with in his attempts to incorporate more test materials which involved cutaneous-kinesthetic discriminations by the blind. The blocks of wood, various objects, and, even, magnetized steel bars which were to be juxtaposed on a metal sheet or plate were, he believed, too cumbersome to incorporate in an intelligence test for blind children.) Since the Hayes revisions of the Binets came to be so generally used, the kinds of behavior sampling involved therein came tacitly to be tolerated, if not actually accepted as highly appropriate psychologically.

1.2 Early Felt Need for a BLAT-Like Approach

The bulk of the efforts which have been reported reflected predominantly a commitment to the testing of the "intelligence" of blind children which had underlying it, at least implicitly, the assumption explicitly stated in the 1920's to the effect that such tests measure achievement in order that the capacity for subsequent achievement might be predicted on the basis of it. Implicitly undergirding this was the further assumption that those whose achievement had been thus measured had had reasonably comparable (rather than identical) opportunities to learn, or achieve. As reasonably tenable, generally, as the latter assumption may be, the blind, and certain other deviant groups, tend not to satisfy this assumption to such an extent that conventional "intelligence" testing approaches would seem of limited appropriateness in their cases. To the extent that blind children, either because of their sensory impairment or of the "protective" attitudes of significant others in their environments, or both, were prevented, in whatsoever manner, from getting the opportunity to learn, regardless of their basic potential to learn if given favorable opportunities, to that extent would they be adversely affected in performing on devices based upon such assumptions.

Here, a current befuddlement regarding the meaning and use of "intelligence" test results should not cloud the issue. On the one hand, such a test score is taken by some to identify, specify, or imply clearly the biologically determined basic learning potential of the child (which no reputable psychologist ever maintained) or is taken to be an earned score somewhat reflective of some kind of learning potential and also considerably reflective of the child's experiential background or condition. Educational action for and thinking about a child based upon the first interpretation presumably would be discernibly different than in the case of the second interpretation. In either instance, however, the fact would be inescapable that the nature of the task of learning by the child still would be suggested by the child's score. (Anastasi, 1967) It was due to the desire to try to correct, at least to some extent, for the fact that so many educators regard "intelligence" test results primarily as reflective of a basic, or biologically determined learning potential and due to the fact that the acculturation of blind children tends, probably much more than in the case of sighted children, to be markedly deviant from an assumed commonality of exposure, or experience, that the present type of behavior sampling approach was adopted. The kinds of behavior sampled by BLAT are believed to be less sensitive to marked differences in cultural backgrounds, but in no sense are regarded as literally "culture free". (It is hoped that the use of training items for each series of test items further reduces the differential impacts of prior acculturation.)

During the years 1937-42, while the author served as Chief of Special Education in the Pennsylvania State Department of Public Instruction, the problem of a sound psychological evaluation of the learning potential of blind and partially sighted children frequently was encountered. Partly as a result of using the Cattell Culture-Free Tests of Intelligence and some Pintner materials in the testing of some 800 acoustically impaired children in three Pennsylvania schools for the deaf and partly as a result of meeting Penrose, who caused the author to obtain from England, in 1938, a set of what is now the Raven Progressive Matrices for trial use with such children, the possibility of adapting materials of that sort for use with the blind seemed worthy of exploration.

Contributive, too, was a rather extensive clinical experience acquired in the psychological evaluation of children since 1925 - particularly from a time when intelligence tests often were used with the blind confidence of the typical novitiate to the time of the

Pennsylvania period when their effectiveness with a number of types of markedly deviating children increasingly seemed questionable, especially when used in the generally prevailing over-slimplified quantitative psychometric manner. Doll and other insightful clinical psychologists were admonishing psychometrists regarding the psychological meaning of test results routinely obtained. Such concern was particularly necessary in the case of those children and adults who constitute a significant portion of any clinic population and who have come out of experiential backgrounds which fail, for any of a variety of reasons, to satisfy the testing assumption of comparability of acculturation. Complicating the psychological evaluation problem, too, was the presence of those individuals whose communication channels - both intake and output - were markedly inadequate. Even though the more-or-less conventional use of existing devices with most children, and even, happily, with a portion of those who were brought into clinics for evaluation, was recognized as reasonably legitimate, the use of such approaches seemed open at least to question with respect to the visually and acoustically impaired and with the cerebral palsied. The markedly limited experiential backgrounds and the unique difficulties inherent in communicating the test stimuli to such children, plus the resulting nature of their responses to such stimulation, constituted a problem of major importance in the clinic, even though it might seem to be of minor (numerical) magnitude, to the psychologist or to the group tester working with non-impaired children. Some psychologically sound way, or ways, of making an effective adjustment to such widely deviant experiential backgrounds and of utilizing the different communication channels of such handicapped individuals seemed needed.

There well may have been present, in the investigator's early thinking at least, the hope that BLAT could become THE test of learning aptitude for the blind. There seemed to be the possibility that other devices, used to sample that area, involved to only a very limited extent the use of touch as a means of "looking" at stimuli, and that this demand figured heavily in the input of the blind. It is quite probable that discussions with Dr. Samuel Hayes, the pioneer psychometrist for the blind, played a major part in coming to see differently the role which BLAT could play. He unhesitatingly regarded the BLAT approach as a valuable adjunct to the more generally used means of getting evidence on the learning potential of blind youngsters, being enthusiastically joined in that view by another major contributor in the field of the blind - Dr. Berthold Lowenfeld. As problems arose and were met, as BLAT came to be perceived as much from a psychological as from a psychometric point of view, and as differing kinds of evidence regarding it became available, BLAT's adjunctive relationship to the Hayes-Binet and the WISC verbal tests increasingly contributed to a rationale wherein BLAT came to be regarded as sampling "process" - the basic potential of the child to learn, in contrast to the Hayes-Binet and WISC which were regarded as sampling to a much greater extent "product" - what the child has learned from which a prediction is implicitly made regarding the capacity to learn. As a result, it was desired to try to develop a test just for blind children which would be somewhat less susceptible to marked deviations in the acculturation to which such children had been exposed, that would involve a cutaneous-kinesthetic input channel, that would necessitate little, if any, verbal output, and that would, it was hoped, throw light more directly upon the fundamental psychological processes by which such a child would do his learning than on what he already had learned.

1.3 Support for Research on BLAT

It was not until 1952 that active exploration of such a problem with the blind was undertaken by the author at the University of Illinois. The Bureau of Educational Research made available a small sum ($150.00) by means of which the first assistant, L.M. Lazowick, a graduate student in psychology, started a search for test items which could be adapted. The University of Illinois Graduate Research Board then supplied major support ($10,000) for help and materials. The graduate assistants thus obtained helped mightily in the development of test materials. Principal among them were Samuel C. Ashcroft, who brought to the task the insight of a former principal in the Iowa School for the Blind; Gerald Shapiro, Roger Frey, Norval Pielstick, and Leonard Lucito. Contributing also to the second phase of the work was the American Printing House for the Blind, where the plates for producing the embossed items were made and the items were produced. The author, with very significant help of these assistants, administered a pool of BLAT items to blind and partially sighted children in residential and day schools in five midwestern states. In the second stage, made possible by an even larger grant ($15,000) by the American Foundation for the Blind, Joseph Twaranovica and Donald Douville went to the West and East coasts, respectively, where each spent a semester obtaining test responses for and data on residential and day school youngsters in two western and two eastern states. In the final stage of data collection, funded by a research grant ($40,000) from the U.S. Office of Education, a group of (mostly) graduate students were trained and taken to the state schools for the blind in Alabama, North Carolina, and Tennessee. Mrs. Carole Fogle, Harvey Thornburg, and Thomas Anderson carried major responsibilities in this phase of the work.

The work could not have progressed, of course, without the help and cooperation of the administrators and teachers of the schools in which the children were tested. To the individuals named here and to the many others who were most helpful, heartfelt gratitude and appreciation are expressed. The names of the state schools and the superintendents are as of the dates when testing was done there.

Mid-West	Residential Schools	Day Schools
Illinois	Illinois State School for the Blind L.J. Flood, Supt.	Champaign Chicago City Schools Oglesby Bell Corkery Lincoln Marshall High McPerson Perry Pierce Spaulding Talcott Van Humboldt
Ohio	State School for the Blind W.G. Scarberry, Supt.	Cincinnati
Wisconsin	State School for the Blind Raymond E. Long, Supt.	Milwaukee
Pennsylvania	Western Pennsylvania School for the Blind A.G. Kloss, Supt.	Pittsburgh
Michigan	State School for the Blind W.J. Finch, Supt.	

West Coast	Residential Schools	Day Schools
California	State School for the Blind Berthold Lowenfeld, Supt.	Berkeley Emerson Jefferson Los Angeles Francis Blend Irving Junior High Marshall High School San Francisco Lawton Sanchez
Oregon	State School for the Blind Everett Wilcox, Supt.	Eugene Condon Ida Patterson Santa Clara Portland Arleta Atkinson Beaverton High School Capitol Hill Fowler Junior High

Oregon	State School for the Blind Everett Wilcox, Supt.	Portland (Continued) Girls' Poly-Tech Hosford Lent Lincoln High School Meek Menlo Park Portsmouth Rigler Riverdale Sacajawea Shattuck Troutdale Vosta Whitman
East Coast	Residential Schools	Day Schools
Massachusetts	Perkins School for the Blind Edward J. Waterhouse, Dir.	Medford Dame Roberts Junior High Quincy Coddington Malden Emerson Weston Meadowbrook Braintree Liberty
New York	State School for the Blind Eber L. Palmer, Supt.	New York City Schools PS No. 167 PS No. 168 PS No. 175 Grover Cleveland High Charles Evans High Schools
South	Residential Schools	
Alabama	Alabama Institute for Deaf and Blind Richard H. Gentry, Supt. B.Q. Scruggs, Principal Carl Monroe, Principal, School for Colored Blind	

South	Residential Schools (Continued)
North Carolina	The Governor Morehead School Egbert N. Peeler, Supt. John M. Calloway, Principal, Ashe School M.H. Crockett, Principal, Garner School Lorraine Simms, Psychologist Rachel F. Rawls, Director of Research
Tennessee	Tennessee State School Clay Coble, Supt.

Formal, though wholehearted, appreciation is herewith expressed to the students who participated in the phase of this study made possible by the current grant. Those from the University of Illinois who collected the initial individual psychometric data were:

Thomas H. Anderson
Donna Bolian
George Camp
Earl Carr
Richard Cima
E.D. Feicht, Jr.
Carole Fogle
Stephen Foster
Patricia Hamilton
Charles Hannen
Edward Kirby
Sandra Kirby
David Kuypers
Margery Lewy
Ralph Lubitz
Alan D. McClain
Louis Thayer
Harvey L. Thornburg
John Wortman
Sharon Steiner

Those from George Peabody College for Teachers who collected BLAT retesting data and helped in administering the Stanford Achievement Tests in the Tennessee School were:

Virginia Binnie
Roy Brothers
James H. May
Steve Nichols
Judi Rose
Rune J. Simeonson
Winifred Thompson

Thus, it can be seen that the standardization data for BLAT, for both the pre-project period and the project period, were obtained from 12 states - five mid-western, two west coast, two east coast, and three southern states. These data include performances by children in 12 residential schools and 55 day schools.

1.4 Pre-Project Work on BLAT

1.41 Rationale for a Test for a Specific Population. Regardless of the nature of the population under consideration, a fundamental decision always has to be made as to the most appropriate means by which the academic learning aptitude of that group should be ascertained. Valid as this observation is even in the cases of populations that are not markedly deviant - populations of "normal" heterogeneity, it becomes increasingly fundamental as the population is known or believed to differ from what generally may be regarded as "normal". Even though populations may differ in known respects - visually or auditorially impaired or non-impaired, cerebral palsied or non-cerebral palsied, disadvantaged or non-disadvantaged, white or non-white, left-handed or non-left-handed, male or female - one need is common to all of them: The ascertainment of their capability to learn usually in school, or school-type situations, whether at the pre-school, elementary school, or secondary school level.

The determination of differences among populations to be tested must be made with regard to two major factors. The more important of these is the problem of communication which may have either or both of two important aspects - that of input, or the examiner's communicating the test stimuli to the subjects, and that of output, or the subject's communicating his responses to the examiner. In the case of the deaf, generally, input constitutes the major problem and output may or may not be a problem, depending upon the nature of the response to be evoked by the test stimuli. With the blind, generally, the input problem is of considerable significance and, usually, the output problem is of considerably lesser magnitude. The cerebral palsied, on the other hand, well may involve both input and output problems to near-equal degrees. Little seems to be gained by trying to analyze this problem in terms of nervous system impairment or involvement since sensory nervous system impairment presents problems of input, motor system impairment presents problems of output, and central nervous system impairment affects intellective functioning which itself is presumed to be tapped by validated "intelligence" tests.

Those who have worked clinically with children markedly deviant in sensory-motor areas have, for a considerable time, been quite sensitive to the fact of marked differences in the acculturation of such children. However, social and psychoeducational concern about differences between the acculturation of the "disadvantaged" and that of the larger "typical" population has resulted in a generally greater awareness of the importance of such differences among populations whose learning aptitudes are to be ascertained. It is difficult for the lay or psychometrically-uninformed person to decide just to what extent it is necessary or appropriate to differentiate among populations in terms of their acculturation, as evidenced by overgeneralized attacks on "intelligence testing".

A decision thus to differentiate must be made on the basis of the following factors, taken either singly or in combination. First, the possibility of significant differences in acculturation must be recognized to the extent that the children under consideration have been physically impaired (sensory handicapped or crippled), hospitalized, institutionalized, or "hot housed" (given some form of relatively intensive cognitive nurturance, as in the case of being supplied with extensive play or learning materials, persistant stimulation, planned or otherwise, by the adults in their environment). Second, the younger the children under consideration, the more the possible importance of differences in acculturation must be recognized, due particularly to the possible effects of limited environments. This is particularly true in the cases of physically impaired children who have been "sheltered" and overprotected by others in their environments as well as in the cases of "culturally disadvantaged" children. The older the children, the greater the chances of their being subjected to the nurturant stimulation of varied extra-home environments. In the third place, if the purpose of testing the children concerned is just to predict how easily they will learn in school, the less crucial becomes the need to differentiate among them in terms of possible differences in acculturation. Important as these differences may be, the fact remains that the ease with which children will learn in school is a function of both what their basic, or inherent, learning capacities may be and what they have acquired as a result of whatever acculturation they may have had. A fourth consideration in deciding whether to differentiate among the children to be tested for school learning aptitude must be based upon the extent to which there is a commitment to get information on how much they differ in those psychological processes which underlie all learning, which, in reality, make it possible for children to benefit from acculturation. From this point of view, differentiation among the children in terms of their kinds and amounts of acculturation is relatively less important, but still recognizing that different kinds and amounts of acculturation will have had differing nurturant effects upon those psychological processes (as contrasted with the different "things" which the children may or may not have learned). The third point, in effect, ignores the fact of differences in acculturation per se since the purpose of the testing is to try to find out how easily the child is likely to learn as of his present, overall condition, whereas the fourth point pertains to the extent to which we are interested in finding out about the child's basic learning potentials as independently as possible of what he has learned.

Attempts to adapt "intelligence" tests to specific populations, or to develop such tests specifically for any given population, seem not to have been based upon an analysis of the factors involved such as has been presented. From the time of Pintner and Paterson, who devised their scale of performance tests "with the deaf child in mind" (1925, p. 20), to Hayes' adaptations of the Binet for use with the blind to Allen's (1956) suggestions for adapting the 1937 Binet for use with the cerebral palsied, to mention only an illustrative few, the efforts were exerted primarily in terms of the input and/or output problems. In none of these cases was a test developed for a specific population. Further, these, and other, tests had been developed on a psychometric basis: Results on them correlated positively with learning behavior, discrimination among those tested was accomplished, and reasonably normal distributions of scores resulted. At best, there was correlational evidence of concurrent and predictive validity. In these, and most other similar undertakings, there appears to have been no formal commitment to any basic theory of "intelligence" prior to the adaptations.

One more consideration is necessary. If a test is to be developed for a specific population, or sub-population, would there be any conditions in that sub-population which would justify or invalidate the assumption that the "intelligence" measured by that test would be normally distributed? In the case of the blind, it could be argued that since their impairment essentially is in the sensory area rather than in the central nervous system, one could expect that the average performance of, say, a random sample of blind ten-year-olds on a test having construct validity would be reflective of much the same degree of measured "intelligence" as on a random sample of non-blind ten-year-olds. This assumption is regarded as reasonably tenable with respect to BLAT. Possibly it could be somewhat attenuated by the fact that 36.3% of those in the standardization population were known cases of retrolental fibroplasia.

While it was true that the Hayes-Binet and the WISC Verbal tests (with or without slight modifications made on some a priori basis) were used with blind children, and seemed to yield reasonably meaningful results, they involved primarily auditory input and verbal output, rather than a cutaneous-kinesthetic input. Further, there existed the not unreasonable possibility that the acculturation bias of such devices might weaken the validity of their use with the younger and/or newly-admitted blind children in educational programs.

On the basis of the foregoing, then, it would seem to be defensible to claim that BLAT can be justified as a special test for a sub-population - blind children. As will be seen, later, appropriate input, tactual-kinesthetic, is provided for. Output relatively independent of acculturation is provided for: The child can respond merely by pointing; he can give an attending vocal response, but that is not required. The perception of the test items relies to a very limited extent upon the effects of acculturation. From a construct validity standpoint, as will be seen later, they sample predominantly Spearman's "g", reflecting the fundamental psychological operations by which the child learns, rather than what or how much he has learned.

1.42 The Validation Problem. Since the "intelligence" tests used with blind children were regarded as having limited value in sampling learning potential - due to the nature of behavior samplings made and the very widely differing kinds and amounts of acculturation among blind children, a conventional concurrent validation procedure was believed to have markedly limited value. The position, therefore, was taken that BLAT had to be validated primarily "from scratch".

The rejection of an intent to develop a test the scores on which would correlate in a high positive manner with those on extant devices, such as the Hayes-Binet or the WISC, was based upon a desire to create a device that would avoid a sampling of behavior that was, presumably, considerably culturally biased. Therefore, it was anticipated that, while scores on BLAT would correlate positively with those on the Hayes-Binet or the WISC, this correlation would be lower than, say, that between scores on the Hayes-Binet and on the WISC. It was hoped that the correlations between BLAT and the Hayes-Binet, and between BLAT and the WISC, would be lower among younger subjects than in the case of older subjects. The decision was made, therefore, to proceed on the basis of a commitment to a Spearman, or Spearman-like, perception of intelligence.

Given a pool of items, it was desired that some constellation of these would yield responses from children which would discriminate across a chronological age range from six through sixteen years. In other words, the average score of a random sample of seven-year-olds on some yet-to-be specified pool of items would be higher than the average score of such a sample of six-year-olds on the same pool of items, the average scores for eight-year-olds would be higher than the average score for seven-year-olds, and so on. This kind of empirical information (progressive discrimination across ages), coupled with the posited construct, was taken as primary evidence of validity. Once such a pool of test items satisfied these two conditions, (the Spearman construct commitment and discrimination across ages), the performances of children on that pool could be compared with, but not anchored upon, the children's performances on the Hayes-Binet and/or the WISC verbal tests.

The possibility of obtaining from the children's teachers' judgments of the children's ability to learn was considered as another possible means of ascertaining concurrent validity. However, the judgments of teachers of blind children were regarded as too likely to be contaminated by aspects of teachers' attitudes toward children's behavior in areas other than learning to make this approach to concurrent validity sufficiently definitive to pursue. Similarly, the possibility of using teacher judgments of the educational achievements of their children was given only passing consideration because of the probable presence here, too, of contaminating factors in such evaluations. School marks given blind children were regarded as too contaminated to constitute a sound criterion. The possibility of comparing performances on BLAT with already-obtained scores on objective achievement tests across the full age ranges offered little promise, largely because of the scarcity of such information, particularly at the age levels involved, and also because of the extrapolations from differing testing times which would have been necessary to bring the data into comparable frames of reference.

A pseudo-predictive validity approach, however, was possible by means of comparing performance on BLAT with currently obtained objective measures of educational achievement. It was possible, in the later segment of the study, to administer at least significant parts of the Stanford Achievement Tests to a sample of blind children, who also, within the same year, had earned scores on the BLAT pool of items.

Since, in the stage of the study made possible by the USOE grant, Hayes-Binet and WISC verbal results also were obtained or available on the children who had earned scores on the BLAT pool of items and on the educational achievement tests, it was, therefore, possible to ascertain the following kinds of information contributive to this later phase of the study:

1. Relationships between BLAT performance and each of the parts of the Stanford Achievement Tests used ("Total achievement score" was regarded as grossly less meaningful, either educationally or psychologically, than the scores on specific parts of the test.);

2. relationships between Hayes-Binet performance and each of the parts of the achievement test;

3. relationships between WISC Verbal performance and each of the parts of the achievement test; and

4. relationships between various combinations of BLAT, Hayes-Binet, and WISC Verbal scores and the several parts of the achievement test.

In sum, then, the evidence to be presented regarding the validity of BLAT is of the following nature. Given the construct orientation,

1. performance on BLAT progressively improves across random samples of increasing chronological age levels;

2. performance on BLAT correlates well enough with performances on Hayes-Binet and WISC Verbal to suggest that the measurements are in a comparable domain, yet low enough to suggest differences in the behavior samplings; and

3. performance on BLAT correlates promisingly with measured educational achievement, as compared with correlations between performances on the Hayes-Binet and WISC Verbal and measured educational achievement.

1.43 Rationale for the BLAT Items. In 1952, a variety of "intelligence" tests, including the Cattell Culture Free, the Raven Matrices, the Kuhlmann-Anderson, the Kuhlmann-Finch, the Chicago Non-Verbal, the Michigan Non-Language, the American Council on Education, and others were examined to identify possible items which might be used as they were or which could be adapted for possible use. A file of between 350 and 400 items was developed from these sources, plus some created de nouveau. This selection and creation of possible items was carried out in terms of a Spearman type of thinking about the nature of the behaviors to be sampled. This basic construct orientation was maintained, with the following restrictions being imposed:

1. The test items were to be in bas relief form, consisting of dots and lines.

2. The spatial discriminations to be made by the child among these dots and lines were to be greater than those called for in the reading of braille.

3. No stimulus materials, other than the directions, were to be verbal in nature.

4. Verbalization of response was not to be required in solving the items or in specifying the solutions to items. Pointing behavior was to be accepted although accompanying verbalization could be accepted.

5. A variety of test-element patterns was to be developed, all of which would necessitate eductión of relationships and/or correlates by the child.

1.44 Development of the Test Materials. A pool of 94 items originally was identified for reproduction, embossed on regular braille paper, and administered from May 8, 1953, to May 21, 1954, to 313 children, ages 5 to 21. Due to the pressure and perspiration involved in the subjects' exploring the items, it was early decided to cover the stimulus and response elements, and their immediate field, with shellac. This not only increased the life of the test items, but was believed also to increase the cutaneous contrast effect.

By February 9, 1955, the pool of items was reduced to 84, and these were administered, from then until March 18, 1963, to 624 additional subjects over the same age range. For this period the items had been reproduced on a plastic substance - a cellulose acetate. Even though, during this time, there had been some exploration of the use of pressure and heat procedures which might be employed in the production of brailled materials, the plastic BLAT items had been produced solely by printing them between the zinc sheets which had been used in printing them on braille paper. While the amount of tolerance between the zinc sheets presented no problem when even heavy braille paper was used, it was not adequate when the plastic material was used, without heating. Some 40% of the dots which made up various item elements were damaged, mostly by virtue of the partial cutting away of the bases of the dots and, much less, by the cutting out of the tips of the dots. Fortunately, such imperfections did not appear to render any of the item elements inadequate. (The results of explorations of the use of other materials and production processes suggest that, when the time comes for the commercial production of BLAT, effective production of very desirable test materials, by means of the existing plates, is possible.)

The test items were "printed" on leafs 10" x 5-3/4" in size. All dots and lines were embossed at braille height, .015". The spaces occupied on the leafs by the test items, the total "visual" field with which the child had to work, ranged from 7" x 1" to 7" x 3-1/2" .

Early in the exploratory stage of BLAT test item development, it was assumed that it would be desirable to have a category of items which involved the identification of response elements which had been rotated through space vertical to the surface on which the stimulus element appeared (turned over rather than rotated on the surface on which the stimulus element appeared). This resembled the "mirror image" type of item on some tests, allowing for the mirror to be on either the X- or Y-axis. The assumption here was that this kind of item would sample behavior relevant to the blind person's writing braille by means of stylus and slate but having to turn the paper over in order to read the impressions so made. After trying this kind of item on some 100 blind children of varying ages, it was found that it was extremely difficult for the children to comprehend the nature of the test task and that discrimination across age levels was not accomplished. This category of items was discontinued after inquiry among teachers of the blind evoked the general opinion that braille writing habits (with a stylus) and braille reading habits were quite discrete learnings which involved little, if any, transfer from the one space orientation to the other. The increasing use of braille writers further seemed to reduce, although not eliminate, a need for a major concern about this matter. Some definitive research on this problem is needed, however.

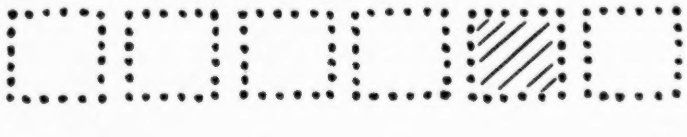
In the early stage, also, some series of test items were made out of masonite, with the major dimensions of the elements varying from one inch to two inches. The stimulus and response elements were glued on masonite panels 3" or 4" wide and 15" long. This kind of lay-out of test items was found to communicate the nature of the tests no better than, and often less well than, the embossed items. Due to this fact and the physical clumsiness of even one series of items so constructed, further development and use of such materials were abandoned.

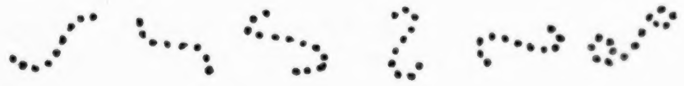
On the basis of the responses of the "original" 937 children, aged 5 through 21, 551 of whom were in the "educationally blind" category, the 84 items were further edited. All responses had been made a matter of IBM record. The percentages passing at the different age levels were ascertained and the resulting evidence of the discriminability of each item was plotted graphically. (This was done separately for the "born blind", the "adventitiously blind", and the partially sighted. From an inspectional standpoint, no consistent differences among the groups were apparent. However, as has been stated, all subsequent discussion is in terms of only the educationally blind - the performance of only those children who used their fingers in solving the problems.) Since the median number of children at the several age levels in this sample was, at most, 48, judgments on the discriminability of the various items were made, instead of making the statistical analyses of item difficulty customary in standardization studies involving much greater N's. Items were dropped whose curves reflected inadequate evidence of discriminability, whether across all age levels, or over some major portion of the age range. This resulted in a residual pool of 49 items.

The distributions of the children's uses of the different response elements of the items were examined, resulting in the relocation of some of them in the effort to avoid position response sets, and some minor editing of specific elements was done. (One compulsive youngster discovered one dot too many in a line in the correct response element!)

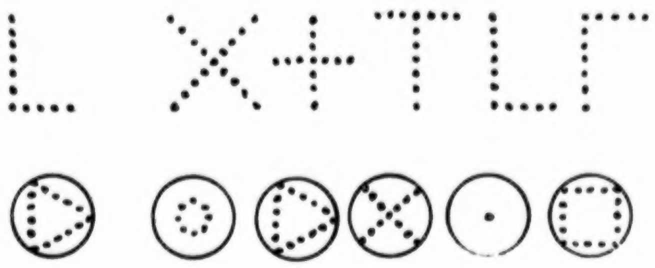
It was this edited and selected pool of 49 items which was used in the collection of BLAT responses over the period of September 1 through January 31, 1967, when 350 additional (educationally blind) children were tested. Even with the total pool of all testings by means of BLAT, the median number of educationally blind children at specific ages over the age range of 5 years to over 18 years was 75.

The BLAT test materials on which this standardization is based consisted, then, of the 49 test items which had been selected out of the original, larger, pool, plus 12 training items. Two training items precede each group of test items. The test items were regarded, on an a priori basis, as falling into six categories. The first category consists of items in which the child is required to identify which of six test elements was "different", or "didn't belong with the others", as in the illustrations below.

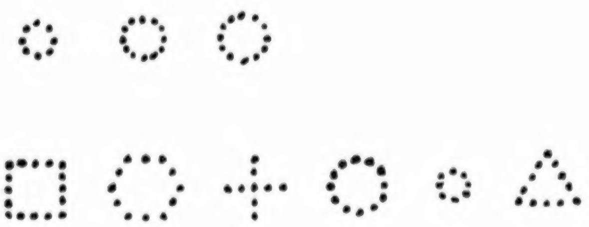


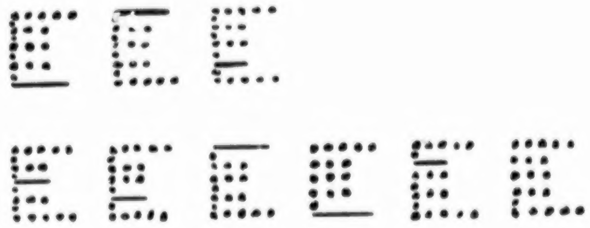


The second category consists of items in which the child is asked to identify which one of five possible response elements was "the same as", or "just like" the stimulus element, as illustrated below.

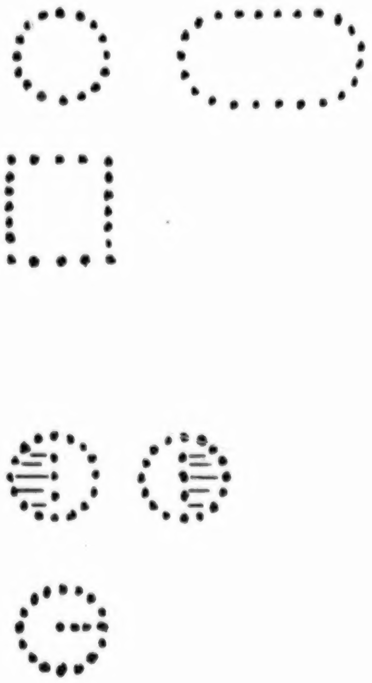


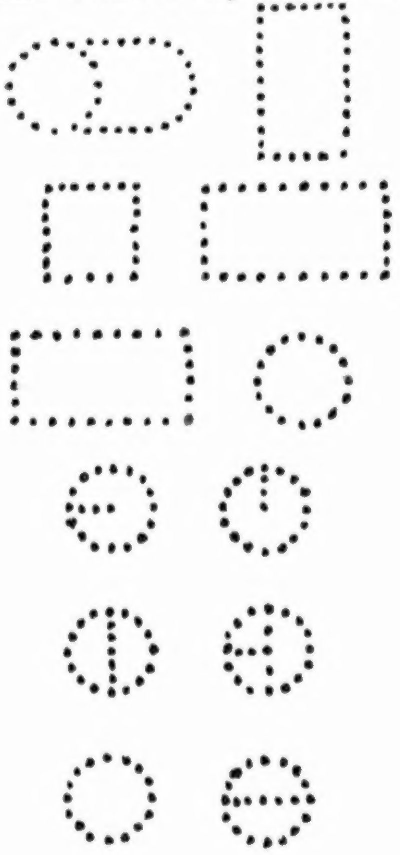
A third category is a "What comes next?" type in which the child is presented with three stimulus elements representing some kind of progression. He is then asked to examine six possible response elements and to designate the one of them which should come next in the series of stimulus elements. Two illustrations of this category are presented.



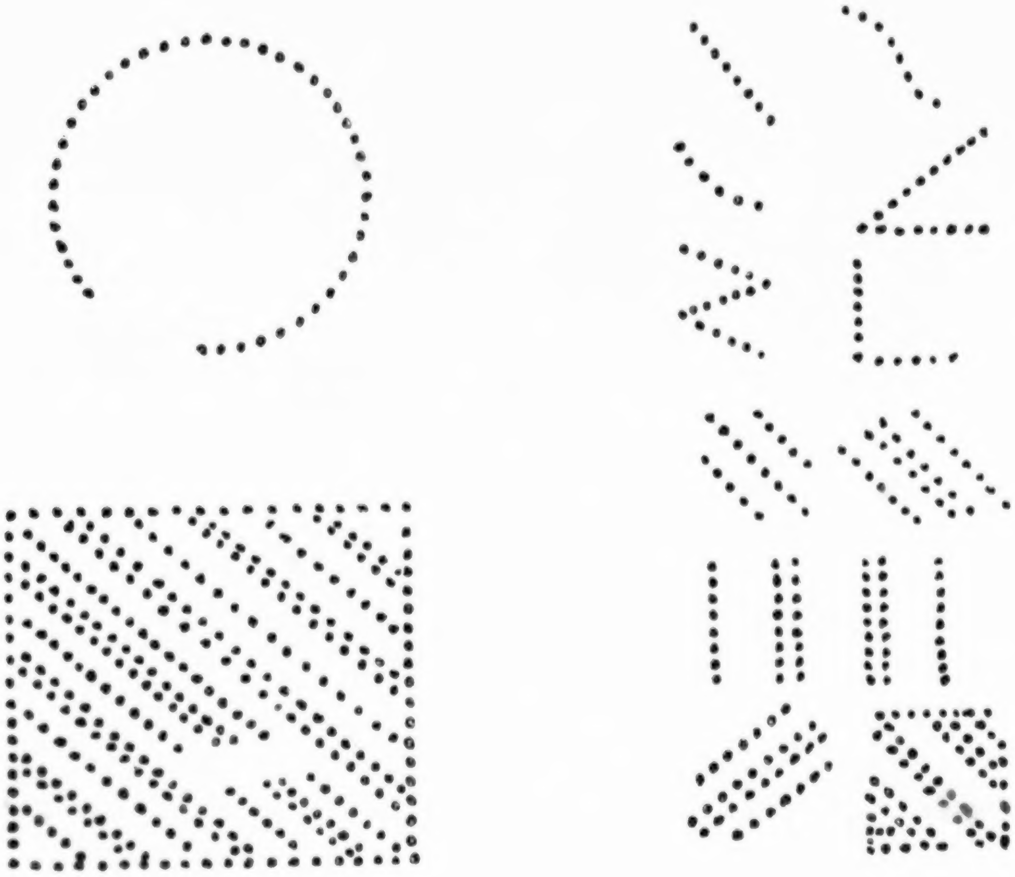


A fourth category is made up of items which involved the A:B::C:D relationship. Here the three stimulus elements are set up to reflect the A:B::C:what? relationship, and the child is asked to identify that element among six possible response elements which satisfied, or completed, the relationship. After much exploration as to the most effective manner of communicating this task to blind children, the following format was found to work very well.



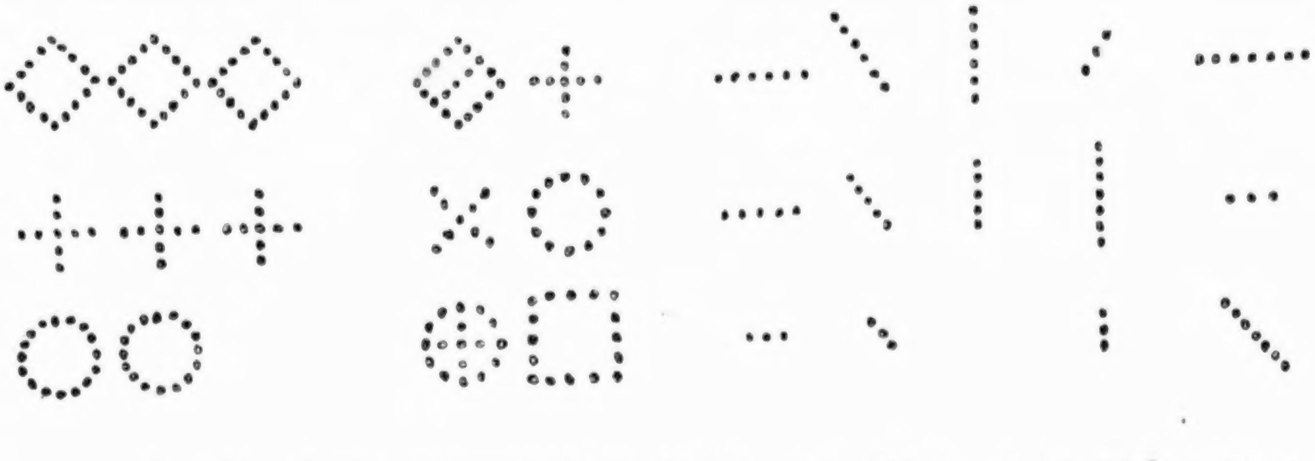


The fifth category presents a figure-completion and pattern-completion type of problem to the child, as in the following:



Here the child is helped to look at the stimulus elements as a circle and as a rectangle (without the use of such terms by the Examiner) and then helped to look at the response element in order to identify the one that is needed to complete the stimulus figure.

The sixth category consists of matrices which, when completed, would be made up of nine elements. Eight of the stimulus elements are supplied, and the ninth one is to be selected by the child from six possible response elements as in the following:



In all of the illustrative items, the first is in each case a training item.

1.45 Development of Procedure for Administering BLAT. From the outset, the paramount commitment in administering BLAT was to seek to communicate to blind children from the age of 5 up, the tasks presented by the several kinds of items. The moderate experience of the author with the blind, informally picked up in connection both with a fair amount of observation of the learning procedures and problems they manifested in classrooms and with experience acquired in psychologically testing them, provided some initial basis in terms of which the early administration of the BLAT test items was undertaken. Initial directions were tried out by him and his two assistants. Full notes were kept on problems encountered and the directions modified accordingly. By the time the first 50 or so children had been confronted by the BLAT items, the procedure was relatively stabilized so that only minor changes in the directions resulted thereafter. Particular attention was paid to the problem of obtaining psychologically meaningful, or plausible, responses for younger or less capable children. Since no evidence was at hand at first regarding demonstrable difficulties of items, all children were administered all of the 94 original items. After the testing of the midwestern population was completed, items were identified which did not appear to discriminate across age. The training items were taken for this group.

The resulting Manual of Directions is incorporated in Appendix D. (A translation of it has been made in Spanish, a result of some exploratory work with BLAT in Colombia, South America, by Mrs. Donna Bolian in the summer of 1968.) Since the primary focus has been to try to communicate the psychological task to the child, a variety of verbal instructions is provided, and the examiner is encouraged even to make use of idiomatic equivalents. This is permissible so long as the examiner keeps certain points constantly in mind: The subject (S) is to be helped as much and as often as appears necessary to "set his total visual field" - the full space over which the stimulus and response elements are spread. S is to be caused to perceive each of the stimulus and response elements as individual components. S is to be caused to see the stimulus elements as whatever groups are necessary whenever such perception is essential to a comprehension of the demand of the item. The examiner (E) is to allow S to use whatever finger or fingers S uses in exploring the stimulus and response elements. E is to guide S in his exploration of the elements and/or the field only to the extent and in a manner that is acceptable to S. (Some Ss resent excessive guidance; others need a great deal.) E is to keep his vocabulary as simple as in the directions, if he does any improvising in the directions as they are stated. E is not to make any vocabulary demands upon S, but to accept whatever verbalization S may employ. Gross gestures, or pointings, are as acceptable as verbalizations of response. All training items are to be mastered (with or without verbal accompaniment, as appropriate to S), unless comprehension of the item presented is clearly not possible.

That the manual is adequate is suggested by the high correlation of the results obtained on a population of 93 children who originally were tested on BLAT by examiners trained by the author and who were retested by seven persons who had only the manual to go by.

1.46 Problems of Data Collection

1.461 The Population Problem. In test standardization the customary practice is to seek to obtain a standardization population that closely parallels the total general population for which the test is being developed. This is reasonably possible when the proposed test, either group or individual, is intended for use on an essentially "general" population, say on children in the age range of 6 through 15, or 6 through 12, or even, 3 through 6. In the case of a test to be used on a general population that is to be administered individually, the availability of a potentially adequate standardization population presents no insurmountable problem, but the availability of persons qualified to administer such a test presents more of a problem. In the case of an individual test for the blind, both of these facets present very real problems. In the first place, the total visually impaired population constitutes approximately one-fourth of one per cent of the total population, and the blind constitute only approximately one-fifth of this sub-group. In other words, only one child in some 2000 is "blind". Not only is the number of this target population quite low, but the accessibility to this population presents a problem since some portion of them is not in school. In the second place, the number of persons qualified and available to administer an individual test is very limited.

Therefore, the approach used in the standardization of BLAT was to obtain as large a standardization population as possible, trying to avoid, as much as possible, grossly distorted samplings at particular age levels. For some reason or reasons (school attendance enforcement practices, the welfare role which schools for the blind play, or some other condition) the pupil populations within schools for the blind do not yield distributions by age levels that are comfortably comparable to those in regular public schools. Adding those blind children who attend public schools to those in residential schools still fails, for some unidentified reason, to give comparable distributions at different age levels. Generally, blind children do not start their schooling as early as do sighted children. Compulsory school attendance tends not to be enforced in the case of blind children as consistently as in the case of sighted children. (Interestingly, even in the attempts at early standardization of tests for blind children, this variability in numbers of children at different chronological age levels has appeared.)

In a standardization such as this, one could at best studiously seek geographic representation, make an essentially saturation sampling, and then examine the characteristics of the obtained population, hoping that they do not depart too radically from a "representative" population. Whatever such analyses reveal, the fact remains that the population on which BLAT is standardized is the largest, geographically most dispersed group of blind children to whom any individual test has been administered by carefully controlled test administrators.

1.462 The "Blindness" Definition Problem. Logically, and in terms of practices in educational programs for them, blind children may be regarded as falling into four categories:

The "blind" --
    Category 1: Those blind at birth.
    Category 2: Those becoming blind after birth.

The partially sighted --
    Category 3: Those born that way.
    Category 4: Those who became partially sighted after birth.

Initially, it was anticipated that data would be collected on children in all four categories. However, in the first 300 to 400 cases, only 18 children were found whose medical records suggested that they fell in Category 4. In the early analyses of BLAT performances, therefore, only the first three categories were employed. (Those in Category 4 were put into Category 3.)

However, logical classifications often are at variance with functional classifications. Workers with the blind are distressingly familiar with the elusiveness of a definitive meaning of the term "blind". To some, it means total non-vision at birth, to others it means a total non-vision condition that either has been present at birth or has appeared between birth and some later specified age. To still others, it is taken to denote a visual acuity, in Snellen terms, of 20/200 or less, regardless of when the condition is known or believed to have appeared. To still others, the term "blind" is applied to any person whose visual acuity is so impaired as to necessitate his having to do his "book learning" by reading braille. Some characterize this latter group as "functionally blind" or "educationally blind". (An exception in the latter case exists in certain situations where all the children in a school for the blind, whether "blind" or partially sighted, are required to learn to read braille, presumably on the assumption that certain, unspecified, children who at the moment are partially sighted may have, or later may have, a progressively deteriorating visual acuity which may develop into a condition necessitating the use of braille.)

The futility of operating primarily in terms of the original logical classification scheme was recognized, and the performances of only those children who responded to the BLAT items by touch were used in this standardization. Subjects were identified initially in terms of their being "taught" by means of braille. While early data were retained on those children who had been classified as "partially sighted", the performance of any who were reported as using their sight to whatever extent, in the solution of BLAT items, are excluded from this standardization study.

1.463 The Age Sample Problem. In the process of collecting data in the first nine residential schools (prior to the work under the present grant), two approaches were made to get representative children as subjects. The first consisted of taking all the children available within the age range of five through (or even above) sixteen years of age. Whenever any of the age populations in the schools were regarded as being such as would result in a numerically biasing sampling of any age group, the total specified age group in the school was identified and a randomized sample (every other child, or every third child) was taken. Volunteers were not sought; nor were teachers or administrators asked to select standardization subjects. (As anyone who has worked in this kind of situation knows, principals and teachers, when asked to identify "typical" youngsters for inclusion in such a study, tend more often to bring forth above-average youngsters than they do below-average youngsters.) Thus, the residential school population in this phase of the study constitutes either a saturation sample or a systematically randomized sample taken from a total grade population. As will be seen, even this combined approach failed to give even reasonably equal-sized age samples. (Some curiosity should be entertained regarding characteristics of the residential school population itself which might tend to reflect the fact that, even today, residential school programs tend to have welfare as well as educational functions in our society.) As for the children in the day schools, all those identified were taken. This latter practice could contribute to a somewhat biased sample, especially in those situations where, as some suspect, the more capable are kept in or sent to the public schools for their education. However, since their performances are combined with those of the residential schools, the combined group may be regarded as, perhaps, more nearly approximating a "normal" distribution of the blind than might either of the subsamples.

In the project phase of the research, all the functionally (or educationally) blind residential school pupils in three southern states between the ages of nine and sixteen years of age were tested. BLAT data only were collected, in addition, on the six-, seven-, and eight-year-olds who satisfied the braille-used criterion and were available, plus only an occasional seventeen-year-old who happened to have moved out of the sixteen-year-old category during the period of the study.

It must be remembered by those unfamiliar with the problem of getting young children into educational programs for the blind that the age sample below the nine- or ten-year level is statistically less than ideal.

Chronological ages are used in this study so as to denote midpoints of age ranges. That is to say, a child was taken to be, say, ten years old as of any time between his being nine years, six months old, up to and including his being ten years, five months old. Any child who was sixteen days into a given month was regarded as having an age as of the next following month.

1.464 The Background Information Problem. On each child tested by BLAT, an attempt was made to obtain rather extensive background information - medical, psychometric, educational (test data and teacher evaluation), familial, and socio-economic data. (A copy of the form used for recording this information is incorporated as Appendix B.) This necessitated file searches requiring from fifteen minutes to over an hour per child. All such information was sought from school and/or clinic files. However, there are marked "individual differences" among the schools - both residential and day - as to the adequacy and/or accuracy of such information. Heavily contributive to a lack of fully satisfying information is a marked variability in the amount and kind of home and school background information supplied the schools or obtained by them. Overall, maximum confidence can be placed on the birth dates (obtained from the best official sources), race, and sex of the children in this population.

1.465 Controlled Collection of BLAT Data. All the BLAT scores used in the standardization have been obtained by the author and by students whom he had trained to administer BLAT. The only BLAT scores not obtained in such a tightly controlled manner are those which were obtained in the retesting of 93 children in the test-retest reliability facet of this study. The results of the reliability study are taken to support the view that such a rigid control on getting BLAT scores did not contribute to norming data that are unrealistic or unrepresentative of what is likely to happen in the subsequent use of BLAT.

It is appropriate to introject at this point a statement of the rationale for this controlled approach in test data collection as contrasted with the customary practice of delegating this responsibility to others in the field. Particularly in connection with the early work on BLAT, the feedback obtained from the few administrators of the test items was of great value with respect to the development of both the effective administrative procedures and the nature and format of the materials. A majority of the residential schools either did not have psychologists on their staffs or had persons serving in that capacity whose psychometric training for work with the blind left considerable to be desired. Further, in those instances where there were competent psychologists or psychometrists, the time demands on such persons would have been so great as to mitigate against getting BLAT data without serious encroachment on their time, delay in getting results returned, and possible bias in the selection of the children to be tested. Not included in the analyses made in this study are the data obtained by Hecht. (1965)

An attempt has been made to keep separate the description of the earlier work done on BLAT from that done under the U.S. Office of Education grant, which has made this report possible. To the extent that the description concerned the rationale for BLAT and the development of the test materials, that objective was both logical and easy to attain. However, the consideration of the problems involved in the data collection and the description of the total standardization population necessitated the combining of certain information from both phases of the work.

2. THE PROJECT PHASE

2.1 Collection of Data

2.11 Overview. All BLAT, Hayes-Binet, and WISC data and the background information on the children were obtained under the personal direction of the author at the three state residential schools of Alabama, Tennessee, and North Carolina. The individual testing and information collection was accomplished at the Alabama school, September 9, 1966, to September 15, 1966, inclusive; at the Tennessee school, January 16, 1967, to January 21, 1967, inclusive; and at the North Carolina school from January 23, 1967, to January 31, 1967, inclusive. All the BLAT testing was done, as had been said, by advanced undergraduates or graduate students in education and psychology, none of whom had had formal training in individual testing but all of whom were trained by the author in the administration of BLAT. The Hayes-Binet and WISC testing was done by graduate students in education or psychology who had had formal training in individual intelligence testing. The author provided them with orientation in doing such testing with blind children, supervised them in the testing, and checked all computations. (The scoring of all tests later was rechecked before the results became data for this study.) The physical conditions under which all the individual testing was done varied from adequate (e.g., locations scattered through library stacks) to highly desirable testing in separate rooms.

It had been hoped that all the children aged 9 through 16 in the three schools could be tested by means of all the "intelligence" tests and educational achievement tests. However, such complete data collection was accomplished only in the cases of the learning aptitude tests.

2.12 BLAT. Since standardization data were being sought, the age range of those given BLAT was extended downward to include six-, seven-, and eight-year-olds. Whenever time was available or adequate results were in the schools' records, Hayes-Binet and WISC verbal results were obtained in these younger children.

2.13 Hayes-Binet and WISC. The Hayes-Binet and WISC Verbal data were obtained for this study in two ways. For the most part, these tests were given to each child used in this study by the 13 graduate students working in the project. The results of these testings were reported to the schools.

Some ten per cent of the scores on these tests were obtained from the school records. In all such instances, the author read over the full psychometric or psychological report on each child and decided whether the results appeared to be of acceptable quality. No results more than three years old were used. All such suitable results were extrapolated from the times of testing to that of this study. In subsequent descriptions and analyses no distinction will be made between the Hayes-Binet and WISC data thus obtained and those obtained by the testers working under this grant.

In the case of the pre-project population, also, there were results of testing by means of the Hayes-Binet and WISC which were evaluated in terms of their possible use in the total standardization study. Generally, those results were taken for use in this study whenever there was evidence suggesting the competence of the examiner and when the recorded scores seemed "clinically plausible". This was done without any knowledge of the magnitude of the BLAT scores. (This meant that there was still some possibility of bias in those scores which were accepted since such a procedure well could have resulted in the exclusion of certain extreme scores which probably enter into many standardization studies.) When there were two or more testings, and later scores tended to be higher than scores earned at entering or earlier ages, whether by the same device or by different devices, the later scores were taken for use in this study. All such scores were extrapolated, where necessary, to the dates of BLAT testing.

The Hayes-Binet results were dealt with in terms of mental ages, represented in the analyses in terms of months, instead of years and months. In the case of the WISC Verbal results, WISC Verbal test ages were computed by multiplying the children's chronological ages by their WISC Verbal IQ's, these results also being represented in months.

Table 2.13 shows the numbers of pre-project pupils whose Hayes-Binet and WISC Verbal scores were used in the total study. It should be noted that the percentages presented under the different columns reflect only the relative amounts of Hayes-Binet and WISC scores regarded as usable in this study. They do not necessarily reflect the relative frequencies of use of the tests in the three regions. It is interesting to note that the Hayes-Binet tended to be used more than the WISC in the midwest and on the east coast, whereas the reverse was true on the west coast.

TABLE 2.13
NUMBERS OF PRE-PROJECT PUPILS, BY AGE, WHOSE HAYES-BINET AND WISC VERBAL SCORES WERE USED

	MIDWEST				WEST COAST				EAST COAST				Totals on Whom Scores Available		
Ages	Took BLAT	H-B Scores Used	WISC Scores Used	Both H-B & WISC Avail.	Took BLAT	H-B Scores Used	WISC Scores Used	Both H-B & WISC Avail.	Took BLAT	H-B Scores Used	WISC Scores Used	Both H-B & WISC Avail.	H-B	WISC	Both
20	9	5	8	5	-	-	-	-	-	-	-	-	5	8	5
19	14	7	6	3	-	-	-	-	2	2	2	2	9	8	5
18	25	14	16	10	5	1	5	1	3	3	1	1	18	22	12
17	27	15	14	6	7	5	6	4	9	8	6	5	28	26	15
16	32	18	16	8	11	6	10	5	7	5	6	4	29	32	17
15	27	18	6	3	10	7	8	7	7	4	4	2	29	18	12
14	25	15	6	3	11	8	8	6	5	5	3	3	28	17	12
13	20	12	7	4	17	9	8	3	6	5	5	4	26	20	11
12	21	14	7	3	17	6	6	-	5	4	3	2	24	16	5
11	26	17	1	1	14	5	5	-	7	5	4	2	27	10	3
10	31	21	3	3	18	2	6	-	13	7	-	-	30	9	3
9	30	17	1	1	15	-	4	-	9	7	-	-	24	5	1
8	36	24	-	-	15	-	7	-	9	2	-	-	26	7	-
7	32	19	-	-	14	-	2	-	4	-	-	-	19	2	-
6	13	5	1	1	3	1	1	1	-	-	-	-	6	2	2
TOT.	368	221	92	51	157	50	76	27	86	57	34	25	328	202	103
%	-	60	25	14	-	32	48	17	-	66	40	29	-	-	-

2.14 Stanford Achievement Test. It was regarded as neither feasible nor satisfactory to give the achievement tests at the same times the learning aptitude tests were administered. While the author offered either to bring testers to the schools to do the achievement testing or, even, to visit the schools and organize and supervise that testing, the school personnel at Alabama and North Carolina preferred to handle this themselves. In the hope that students at the George Peabody College for Teachers who were preparing to teach the blind might acquire helpful relevant experience in administering these tests, the responsibility for carrying out this testing was given to Dr. Randell Harley, who was in charge of their area of professional preparation.

The achievement test materials, obtained by means of this grant, were supplied to the participating schools. Generally, it was decided that the use of answer sheets, even though they were available for certain levels, might create adaptation problems for the pupils which might contaminate the scores on the tests. There were, however, certain exceptions: (1) In the Alabama and North Carolina schools, the pupils wrote the spelling words in all instances except where the advanced level of SAT Spelling was used. (2) In the Tennessee school, the pupils indicated their answers by marking in the test booklets only where the Primary level test was used and in the Intermediate I-A level test in Word Meaning. Due to differences in familiarity with the Nemeth codes employed, Form L was used in the Alabama School and Form X was used in the North Carolina and Tennessee schools.

All the achievement tests were scored by research assistants, and the scoring checked. Where the responses to the Spelling tests were in braille, the assistance of a blind graduate student was obtained. As soon as they were obtained, all achievement test scores were reported to the respective schools.

All SAT raw scores were converted to EGS scores. Three assumptions underlie the use of the SAT results in the analyses which are made: (1) It is assumed that the educational grade status scores (EGS) of the two forms are comparable. That is to say, an EGS in a given subject matter area of, say, 5.4 on Form L connotes an educational status comparable to an EGS of 5.4 in that area on Form X. (2) It is assumed that any given EGS obtained on one level of SAT (primary, intermediate, or advanced) connotes a comparable educational status on an adjacent level. That is to say, that an EGS of 3.5 in, say, Word Meaning obtained on a primary level test is comparable to an EGS of 3.5 in that same area on an intermediate level. (3) In a very few instances where pupils took only one part of a two-part test, the part scores were extrapolated to represent total scores on that content area of testing. Inspection revealed that scores so obtained did not deviate significantly from the range of scores earned by those children who had taken both parts of the test in that particular subject matter area.

No use was made of the designation of the grade levels to which the pupils in this study had been assigned in these schools. As in the case of sighted school children, it was regarded as more important, psychoeducationally, to consider each child's educational achievement in terms of evidence of his own learning capability, rather than in terms of any "average" of the children with whom he happened, for any of a number of reasons, to be sitting.

Table 2.14 (pg. 37) shows the number of children in each of the three schools on whom achievement test scores were obtained. It should be borne in mind that, especially in the Tennessee school, the same children did not consistently take all the parts of the tests that were given. For that reason, in some of the combined correlations later to be presented, the N's will vary.

2.141 Sample Bias in Achievement Testing. As was stated, it had been hoped to have all those children, aged 9 and over, who took BLAT to take the different parts of the Stanford Achievement Test (Word Meaning, Paragraph Meaning, Spelling, Arithmetic Computation, Arithmetic Concepts, Arithmetic Application, and Arithmetic Reasoning) which were appropriate to their chronological levels. The assumption was made that, since the age range of the sample studied was from 9 through 16, a helpful number of the youngest children in the sample should be able to earn some kind of meaningful score on at least the lowest level of the SAT. Had this happened, there would have been some approximation of a "normal" variability in the achievement scores.

However, since the school officials strongly preferred to administer the achievement test, rather than have that done under the direct supervision of the Project Director, the pupils who took these tests were selected by the respective school teachers and supervisors. The extent to which this selection may have affected the population given achievement tests is reflected in the following.

A total of 350 children were tested by BLAT in the three southern schools. Their distribution by chronological ages is shown here. As the study was planned, achievement tests were to be given only to those children who were 9 years of age and older. Thus, presumably, 39 children would not have taken the achievement tests, leaving 311 on whom achievement test results theoretically could be expected - barring any diminution due to transfer out of school since the BLAT testing (those children who transferred into the schools after the BLAT testing and who took one or more parts of the achievement tests were not included in this study), due to absence at the time of the achievement testing, and, possibly due to death. However, due to these factors plus the decisions of the school

C.A.	N
18+	2
17	22
16	37
15	44
14	65
13	37
12	39
11	20
10	29
9	16
8	22
7	15
6	2

TABLE 2.14

NUMBERS OF CHILDREN, BY SCHOOLS, ON WHOM PROJECT TEST SCORES WERE OBTAINED

				LEVEL	STANFORD ACHIEVEMENT TEST													
SCHOOL	BLAT	BINET	WISC		WORD MEANING		PARA. MEANING		SPELLING		ARITH. COMP.		ARITH. CONCEPTS		ARITH. APPL.		ARITH. REASON.	
				-	W	N	W	N	W	N	W	N	W	N	W	N	W	N
ALABAMA (Form L)	94	91	91	P	1	6	1	6	1	6							1	6
				E	13	4	14	5	13	5							13	5
				I	10	6	10	5	10	6							10	6
				A	25	9	25	9	25	8							25	9
					49	25	50	25	49	25							49	26
					74		75		74								75	
NORTH CAROLINA (Form X)	154	149	145	P	15	6	15	6	15	6	14	6	15	6				
				I_1	12	4	12	4	12	4	12	4	12	4	12	4		
				I_2	21	16	21	16	21	16	21	16	21	16	21	16		
				A			26	10	26	10	26	10	26	10	26	10		
					48	26	74	36	74	36	73	36	74	36	59	30		
					74		110		110		109		110		89			
TENNESSEE (Form X)	102	96	96	P	18	6	17	6										
				I_1	7	2	7	2	7	2								
				I_2	7	1	7	1	7	1								
				A			24	3	25	3			24	3				
					32	9	55	12	39	6			24	3				
					41		67		45				27					

officials as to which children should take achievement tests, there was a total of only 249 different pupils aged 9 and older who took one or more parts of the achievement tests on whom all aptitude test results were available, leaving a total of 53 children on whom no achievement test scores were obtained.

In the correlational analyses between capacity (BLAT, H-B, WISC) and achievement, the total population was broken down into three age groupings - those aged 9 to 11 inclusive, those aged 12 and 13, and those aged 14 and above. The 13 children under age 9 who had achievement testing were not included in the analyses in terms of this sub-grouping but were included in other analyses. Presented in Table 2.141 are data characterizing both the population on whom achievement test data were obtained and the population for whom no achievement test data were obtained.

It is apparent from a general inspection of this table, that, as a rule, those not given achievement tests tended to be the less capable youngsters in the different age groupings. The average Hayes-Binet mental age of those in the 9-11 group who took no achievement tests was nearly 7 years; the average of those not so tested in the 12-13 group was about 6 years 10 months; and the average of those omitted from the 14-up group was nearly 11 years. However, it should be noted also that, certainly in the 12-13 and 14-up groups, some children had earned Hayes-Binet mental ages which would lead one to expect them to have been capable of achieving meaningfully (for them and for psychometric reasons) on one or more parts of SAT. Note, also, that in the 14-up group for North Carolina the average BLAT score of the 24 children not achievement tested was somewhat higher than the average BLAT score of those who did take achievement tests. An adaptive use of the achievement tests - giving children such tests as were appropriate to their mental levels rather than in terms of their chronological ages or grade placements - would have yielded additional helpful psychoeducational information. The extent to which lack of skill in braille reading may have been the primary basis for excluding these children from achievement testing is not known.

The suspicion, therefore, is strongly held that "the" educational achievement of the children in this study is not accurately represented in the obtained data. It probably is not peculiar to sighted school children that some of the more intellectually capable ones are perceived by some of their teachers (or supervisors) as not capable of performing significantly on achievement tests when, in reality, some of them perform at average or above-average levels. The data indicate that such well may have been true in this study population. Further, even children who are below average in their learning aptitudes are sometimes capable of earning scores in achievement tests that are above the chance level.

Two conclusions regarding the bias in the results obtained in the achievement testing appear to be warranted: (1) The averages for the different age levels throw only limited light on "the" educational

TABLE 2.141
CHRONOLOGICAL AGE AND APTITUDE TEST DATA ON CHILDREN WITH AND WITHOUT ACHIEVEMENT TEST RESULTS, BY AGE GROUPINGS, BY STATE, AND BY TOTAL

	ACHIEVEMENT				NON-ACHIEVEMENT			
	C.A. (Mo.)	HAYES-BINET MA (Mo.)	WISC TA (Mo.)	BLAT X	C.A. (Mo.)	HAYES-BINET MA (Mo.)	WISC TA (Mo.)	BLAT X
ALABAMA:	AGES 9-11 N=15				AGES 9-11 N=1			
M=	124.5	112.3	110.1	19.5	114.0	76.0	78.0	6.0
σ=	7.8	27.9	17.0	5.8	-	-	-	-
	AGES 12-13 N=20				AGES 12-13 N=5			
M=	151.9	135.3	135.1	21.2	146.8	73.0	79.0	6.2
σ=	5.0	40.3	30.3	8.5	6.9	7.9	10.9	4.8
	AGES 14 Up N=34				AGES 14 Up N=8			
M=	178.3	162.9	174.5	23.9	178.3	130.1	135.5	13.1
σ=	10.4	47.2	38.1	9.2	12.5	47.5	48.9	10.4
NORTH CAROLINA:	AGES 9-11 N=14				AGES 9-11 N=14			
M=	122.8	125.1	116.8	23.6	122.3	84.9	88.5	12.6
σ=	8.6	32.5	25.0	10.2	8.7	12.3	14.4	5.7
	AGES 12-13 N=27				AGES 12-13 N=3			
M=	148.7	144.7	140.4	23.4	144.0	88.0	93.3	16.0
σ=	7.4	35.4	24.3	7.9	3.0	17.8	20.2	7.5
	AGES 14 Up N=68				AGES 14 Up N=7			
M=	179.2	156.2	164.8	25.7	195.6	146.7	168.7	29.1
σ=	12.5	32.6	34.8	9.4	11.2	42.9	40.8	7.4
TENNESSEE:	AGES 9-11 N=14				AGES 9-11 N=3			
M=	118.7	109.7	101.4	18.1	122.3	76.7	82.0	13.7
σ=	8.5	33.4	21.1	7.0	5.6	16.2	20.9	11.0
	AGES 12-13 N=18				AGES 12-13 N=3			
M=	150.5	125.1	129.2	20.1	146.7	88.7	94.7	7.3
σ=	6.9	31.2	28.6	9.8	6.7	51.4	41.0	11.0
	AGES 14 Up N=39				AGES 14 Up N=9			
M=	180.3	148.5	163.7	25.9	185.2	119.6	142.3	15.4
σ=	13.0	46.3	42.9	12.8	14.6	30.4	37.8	11.3
TOTAL:	AGES 9-11 N=43				AGES 9-11 N=18			
M=	122.0	115.0	109.5	20.0	121.8	83.0	86.8	12.4
σ=	8.5	31.2	21.6	8.0	8.1	12.6	14.9	6.4
	AGES 12-13 N=65				AGES 12-13 N=11			
M=	150.2	136.4	135.7	21.8	146.0	81.4	87.2	12.4
σ=	6.7	36.3	27.4	8.6	5.6	26.1	23.0	8.0
	AGES 14 Up N=141				AGES 14 Up N=24			
M=	179.4	155.7	166.8	25.3	185.9	131.0	147.8	18.7
σ=	12.1	40.6	37.9	10.4	14.3	40.0	43.1	11.8

* C.A. - Chronological Age in Months
Hayes-Binet - Mental Age in Months
WISC Test Age (Computed) in Months
BLAT Raw Score

achievement of even the blind children in this study. (2) The correlations between measures of learning aptitude and educational achievement probably are attenuated by this loss of achievement measures on children with average and above-average learning aptitude who were not achievement tested and by the loss of those of below-average capability who did not take the achievement tests.

2.15 Underline BLAT Retesting. To obtain evidence on the test retest reliability of BLAT, 93 children at the Tennessee school were administered the BLAT after a seven-month time interval. This was done by seven Peabody graduate students, who had had no prior experience or training with BLAT.

2.2 Characteristics of Total Standardization Population

2.21 The Total Standardization Population. Presented in Tables 2.21A and B are certain data on the total standardization population, pre-project and project combined. Table 2.21A (pg. 41) shows the distribution of the subjects by age for the residential and day school subjects, and by sex and race. Table 2.21B (pg. 42) shows a consolidation of those data by age, sex, and race.

Concern often is expressed regarding the inclusion of Negroes in a standardization population. In this study, only five per cent of the first 558 youngsters were non-white. The three southern schools were included so as to provide more "representative" standardization data. It will be seen in Table 2.21B, that non-white (There were three known Indians.) youngsters constituted 14.98% of the total standardization population. Whether their performances attenuated the "norms" can be seen in subsequent analyses. Whether separate "norms" should have been suggested for non-white children is at best debatable especially in these days. However, in view of the kinds of behavior sampled by BLAT, and the kinds of predictions to be made from such behavior sampling, there appeared to be little, if any, merit in thinking in terms of separate normative data.

2.22 Representativeness of Standardization Population. The extent to which the standardization population approximates the reality situation in the United States will be shown in terms of a combination of socio-economic status and race tabulations, a combination of race and sex tabulations, and in terms of the extent to which the BLAT sampled varied among the geographic regions involved.

2.221 Socio-economic Status and Race. Whenever the information was available in the children's files, note was made of the occupation(s) of the parent(s), or responsible adult(s), in the child's home. Using a combination of the occupational and educational characterizations of the parents (or other responsible adult(s)), each child was characterized as representing an occupational level according to the occupational level characterization in Table 328 (pp. 232-236) in the 1966 Statistical Abstract of the United States. These characteristics of all subjects were coded by four assistants, who worked as teams of two. The

TABLE 2.21A

TOTAL FUNCTIONALLY BLIND STANDARDIZATION POPULATION BY AGE, TYPE OF SCHOOL, SEX, AND RACE

Age	RESIDENTIAL SCHOOL									DAY SCHOOL								
	BY SEX			BY RACE						BY SEX			BY RACE					
				White			Non-White						White			Non-White*		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
20	6	4	10	5	3	8	1	1	2	-	-	-	-	-	-	-	-	-
19	10	3	13	10	3	13	-	-	-	1	3	4	-	2	2	1	1	2
18	19	12	31	18	12	30	1	-	1	1	1	2	1	-	1	-	1	1
17	31	22	53	27	19	46	4	3	7	9	3	12	8	3	11	1	-	1
16	38	35	73	30	29	59	8	6	14	11	3	14	9	2	11	2	1	3
15	39	36	75	28	34	62	11	2	13	8	5	13	5	3	8	3	2	5
14	48	45	93	41	35	76	7	10	17	5	8	13	5	7	12	-	1	1
13	39	33	72	33	27	60	6	6	12	3	5	8	3	4	7	-	1	1
12	35	33	68	31	27	58	4	6	10	8	6	14	6	6	12	2	-	2
11	30	21	51	26	18	44	4	3	7	9	7	16	8	6	14	1	1	2
10	36	32	68	25	28	53	11	4	15	13	10	23	12	9	21	1	1	2
9	27	17	44	20	15	35	7	2	9	9	17	26	8	15	23	1	2	3
8	32	25	57	28	22	50	4	3	7	10	15	25	9	14	23	1	1	2
7	18	21	39	17	18	35	1	3	4	11	14	25	10	14	24	1	-	1
6	7	6	13	7	6	13	-	-	-	2	4	6	2	4	6	-	-	-
Totals	415	345	760	346	296	642	69	49	118	100	101	201	86	89	175	14	12	26
	Total Residential: 760 (79.08%)									Total Day School: 201 (20.92%)								

* Includes three Indians, on basis of presumed similarity of acculturation information.

TABLE 2.21B

SUMMARY TABLE OF FUNCTIONALLY BLIND BY AGE, SEX AND RACE

AGE	M	F	TOTAL	WHITE	NON-WHITE
20	6	4	10	8	2
19	11	6	17	15	2
18	20	13	33	31	2
17	40	25	65	57	8
16	49	38	87	70	17
15	47	41	88	70	18
14	53	53	106	88	18
13	42	38	80	67	13
12	43	39	82	70	12
11	39	28	67	58	9
10	49	42	91	74	17
9	36	34	70	58	12
8	42	40	82	73	9
7	29	35	64	59	5
6	9	10	19	19	-
TOTALS	515	446	961	817	144

distribution of the standardization population over these categories, by race, is shown in Table 2.221 (pg. 44). The percentages for the white population for the several categories were computed from Table 238 in the 1966 Statistical Abstract of the United States.

Since it was decided to do the norming for BLAT in terms of the total population, combining the scores earned by white and non-white children, there might be some curiosity regarding the extent to which the non-white population may have biased the total sample. The percentages are reported with respect to only the total population for whom occupations were reported. As the footnote to Table 2.221A indicates, the socio-economic status for 13.4 per cent of the total standardization population could not be specified, due to inadequate information in the school records, in contrast with the 5.1 per cent unclassifiable in the U.S. data. It is interesting to note, though, that if the percentages are combined for the top three, for the middle two, and for the bottom three categories, the distribution of the BLAT population closely parallels that of the U.S.

2.222 Race-Sex Distribution. Shown in Table 2.222A below is the extent to which the BLAT population distributions by sex and race resemble those of the U.S. blind population for the age range from 5 through 19. The figures on the BLAT population are markedly in accord with those for the total U.S.

TABLE 2.222A

PERCENTAGES OF BLIND U.S. AND BLAT POPULATIONS, AGED 5-19, BY SEX AND RACE

	U.S.*		BLAT**	
	M	F	M	F
WHITE	55.9	44.1	52.9	47.1
NON-WHITE	57.7	42.3	57.6	42.4
TOTAL	56.3	43.7	53.6	46.4

* Personal communication from Statistical Consultant, National Society for the Prevention of Blindness, November 27, 1967.

** Frequencies of five-year-olds negligible.

Another way to evaluate the adequacy of racial representation in the standardization population is to consider the extent to which the non-white population in it is comparable to the percentage of non-white in the total population. The results of this kind of evaluation are shown in Table 2.222B (pg. 45). In the three southern states from which part of the standardization population was taken, 30% of the population was non-white; the non-white standardization population from these three states accounted for 28%. In the other states, there were 12% non-white as compared with 7% in the standardization population. For all the states in which standardization data were

TABLE 2.221

OCCUPATIONAL LEVELS OF SUBJECTS' MAJOR BREADWINNERS FOR WHITE, NON-WHITE, AND TOTAL BLAT POPULATIONS

OCC. CAT.	WHITE			NON-WHITE			TOTAL		
	N	BLAT %	U.S.%*	N	BLAT %	U.S.%*	N	BLAT %	U.S.%*
1	94	13.0	11.1	4	3.7	4.0	98	11.8	10.4
2	52	7.2	5.6	17	15.6	4.5	69	8.3	5.5
3	66	9.1	11.6	1	0.9	2.3	67	8.1	10.8
4	90	12.5	14.9	7	6.4	6.9	97	11.7	14.2
5	129	17.8	21.6	7	6.4	11.1	136	16.4	20.6
6	104	14.4	20.8	9	8.3	25.6	113	13.6	21.2
7	41	5.7	5.5	30	27.5	15.6	71	8.5	6.5
8	147	20.3	8.9	34	31.2	29.9	181	21.8	10.8
TOTAL	723	100.0	100.0	109	100.0	99.9	832 #	100.2	100.0

* Statistical Abstract of the United States - 1960- Pages 232-236

# Insufficient data from 129 cases (13.4 per cent of the total standardization population) made categorization impossible, in contrast with 5.1 per cent in the U.S. data.

Occupational Categories:

1. Professional, technical, and kindred workers.
2. Farmers and farm managers.
3. Managers, officials, and proprietors, etc.
4. Clerical and kindred workers, including sales workers.
5. Craftsmen, foremen, and kindred workers.
6. Operatives (apprentices, truck drivers, etc.)
7. Private household workers, service workers, farm laborers and foremen.
8. Laborers (except farm and mine).

collected, 14% were non-white, and this group made up 15% of the standardization group.

TABLE 2.222B
RACIAL REPRESENTATIVENESS OF THE STANDARDIZATION POPULATION

	Per Cent of Population Non-White	Per Cent of Non-White in Standardization Population
In Southern States Sampled	30	28
In Other States Sampled	12	7
In All States Sampled	14	15

2.223 Geographic Distribution. Unfortunately, comparative or base data on blind, school-age children are limited. Some of these "data" are no more than crude approximations due to the relative absence of firmer census data even on the actual frequency, or incidence, of blind children. In order to arrive at some idea of how many blind children there might be in the states in which BLAT subjects were tested, it was estimated that .05 per cent of the school age population would fall in the category for which BLAT would be appropriate. Using this percentage and the numbers of children 15 years of age and younger, as shown in the U.S. Statistical Summary (1966), the numbers of potential BLAT candidates were ascertained for the regions (coastal, midwestern, and southern) in which BLAT data were obtained. In like manner, the number of such children in the U.S. (excluding Alaska, Hawaii, and Puerto Rico) were ascertained. Using these data, it is possible to depict the percentages which the standardization population constitutes in regard to the three different regions separately, in regard to those regions as combined, and in regard to the total (presumed) U.S. school age blind child population. Table 2.223 presents these data. Within the three areas combined, 6.8 per cent of all the "theoretically available" children are included in the standardization population. This sample represents 3.5 per cent of "all" the educationally blind in the U.S.

TABLE 2.223

PERCENTAGES IN REGIONS, IN COMBINED SAMPLE AREA,
AND IN TOTAL U.S. BLIND CHILD POPULATION
REPRESENTED IN STANDARDIZATION POPULATION

	COASTAL	MIDWEST	SOUTHERN	COMBINED	ALL U.S.
Estimated Total School Blind Population	5,708	6,618	1,879	14,205	27,743
BLAT Sample	243	368	350	961	961
Per Cent	5.5	4.3	18.6	6.8	3.5

* Statistical Abstract of the United States, 1966.

These analyses appear to suggest that the standardization population (1) is reasonably comparable to the U.S. population in terms of the distribution of their breadwinners' occupations; (2) is highly representative of the race-sex breakdown of blind, school-aged children in the U.S.; and (3) seems only sketchily representative of the theoretical blind-child populations in the states from which it was drawn. As regards the theoretical total number of blind school-aged children in the U.S., the standardization population constitutes a 3.5 per cent sample.

A question may well be raised as to whether the population involved in this standardization is "typical" of "blind children". While certain factors, which have been mentioned may have mitigated somewhat against such a view, this population, on the other hand, can be taken to be reasonably representative of the total population of educationally blind children in educational programs. Admittedly, no evidence can be adduced to prove this. Whether there are hidden idiosyncracies that may affect the results of subsequent uses of BLAT remains to be shown by careful research.

2.3 Standardization Data

The findings will be presented first in terms of Learning Age (Test Age) equivalents and in terms of Learning Quotient equivalents of BLAT raw scores. Sub-analyses of BLAT raw scores will be presented by sex, by race, and by kind of school (residential and day). Accompanying the BLAT means and standard deviations will be those for the Hayes-Binet and WISC tests. While the BLAT errors of measurement will be presented along with the Learning Age equivalents, other reliability information will be presented in terms of internal consistency and test-retest findings. The results of a factor analysis of the BLAT scores will be presented. This section will conclude with correlational information, first in terms of the relationships between BLAT results and those on the Hayes-Binet, on the WISC, and on the Stanford Achievement Test, and also in terms of the relationships between the several measures of learning aptitude and performances on the SAT when the latter are broken down according to certain age groupings.

2.31 Learning Age and Learning Quotient Equivalents. No assumption was made that results on BLAT reflect learning potential beyond that involved in school learning. (While the suspicion is entertained that broader inferences properly might be drawn from BLAT performances, there are no data in this study relevant to that.) Further, in order to help reduce the possibility of confusing the characterization of performance on BLAT with the performances on other tests of learning aptitude, no use is made of the terms "mental age", and "intelligence quotient". The terms "learning age", or even more precisely, "BLAT learning age", and the derived "BLAT learning quotient" are preferred.

Shown in Table 2.31A (pg.48) are the learning age equivalents of BLAT raw scores, with their accompanying standard errors of measurement which were computed on the basis of information presented in 2.331. The errors of measurement are shown only for the full years, since the half-year norms were arrived at by interpolation. As seems to be the case with a test like BLAT, the sharpness of discrimination decreases among the upper age levels. It is possible that had the test been administered under timed conditions, sharper discrimination might have been attained.

Shown in Table 2.31B are the basic data from which the norms presented in Table 2.31A were obtained, with the exception of the standard errors of measurement. Figure 2.31B shows the obtained means and standard deviations, across age, with the best fitting curve for the means and the smoothed curve for the sigmas drawn in.

These norm data represent a composite for the sexes, for the races, and for the two different kinds of schools - residential and day - in the 12 states.

The learning quotients were derived for each level by making a learning quotient of 100 equal to each mean score, and a range of

TABLE 2.31A

Learning Aptitude Age Equivalents for BLAT Scores With Standard Errors of Measurement

A BLAT score of	Suggests a learning aptitude age of an average	With a standard error of measurement of (KR-14)
27	15½ or 16 year old	2.765
26	15 year old	2.823
25	14 or 14½ year old	2.868
24	13½ year old	--
23	13 year old	2.885
22	12½ year old	--
21	11½ or 12 year old	2.847
20	11 year old	2.888
19	10½ year old	--
18	10 year old	2.846
17	9½ year old	--
16	9 year old	2.741
15	8½ year old	--
13	8 year old	2.536
12	7½ year old	--
11	7 year old	2.462
9	6½ year old	--
7	6 year old	1.922

TABLE 2.31B

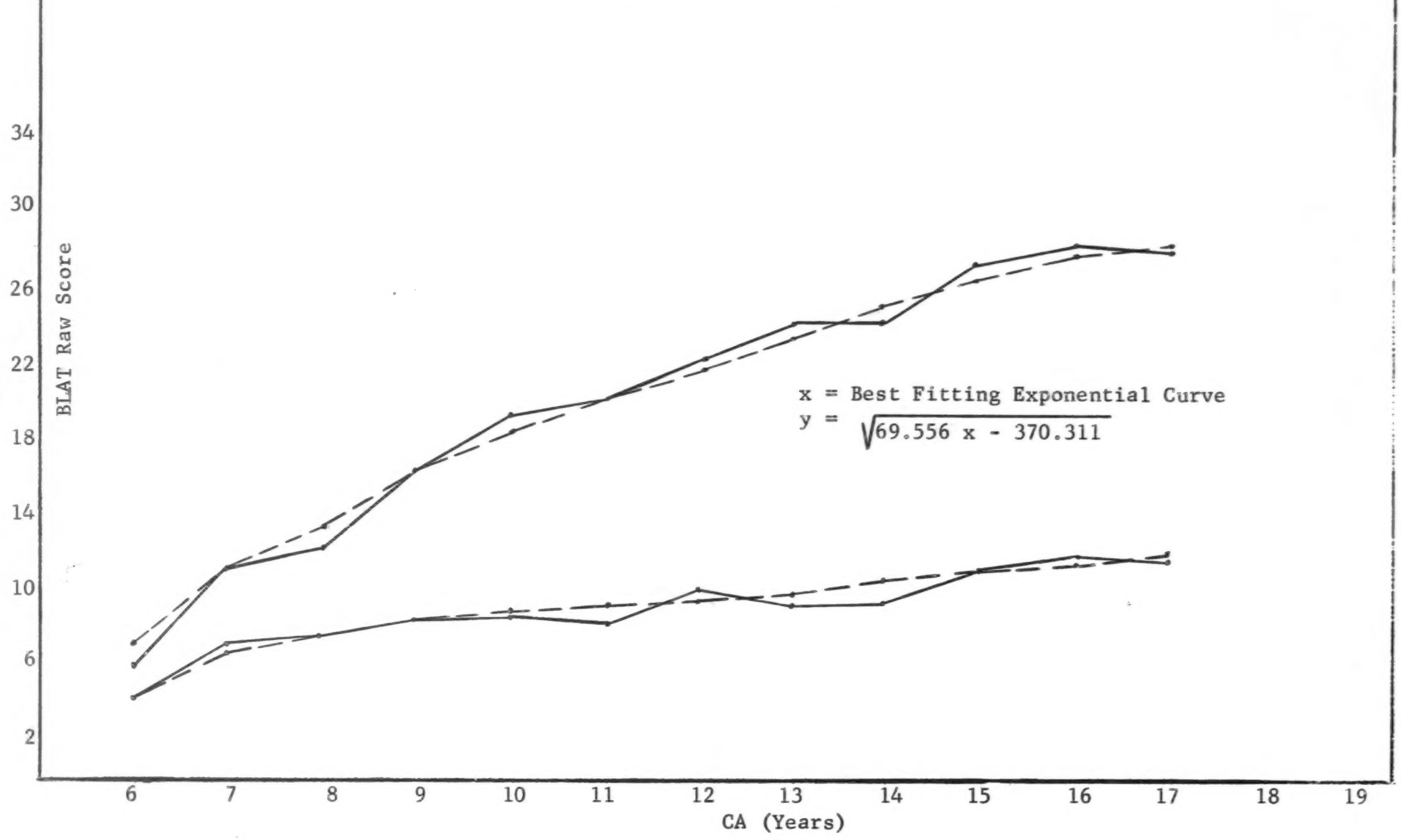
BLAT Norming Statistics

Age(1)	ACTUAL			SMOOTHED(2)		USED AS NORMS		INDEX OF SKEW-NESS	RANGE OF SCORES EARNED
	M	σ	N	M	σ	M	σ		
19	30.88	10.48	17					-.962	5-44
18	34.21	7.50	33					-.309	2-47
17	27.46	9.36	65					-.282	3-45
16	27.49	11.45	87	27.3	11.1	27	11	-.234	0-49
15.5				26.6	10.9	27	11		
15	26.76	10.51	88	25.8	10.5	26	11	.147	5-47
14.5				25.2	10.4	25	10		
14	23.80	9.20	106	24.6	10.2	25	10	-.088	0-43
13.5				23.8	10.0	24	10		
13	23.81	9.20	80	23.0	9.6	23	10	-.174	0-41
12.5				22.2	9.4	22	9		
12	21.88	9.79	82	21.4	9.2	21	9	-.001	1-41
11.5				20.6	9.0	21	9		
11	20.00	7.96	67	20.0	8.6	20	9	.547	1-42
10.5				19.0	8.3	19	8		
10	19.04	8.13	91	18.2	8.1	18	8	-.088	0-39
9.5				17.0	8.0	17	8		
9	16.03	7.90	70	16.0	7.9	16	8	.603	0-42
8.5				14.7	7.6	15	8		
8	12.06	7.18	82	12.7	7.2	13	7	.083	0-28
7.5				12.4	7.0	12	7		
7	10.83	6.83	64	10.8	6.8	11	7	.233	0-26
6.5				9.0	5.2	9	5		
6	5.89	4.13	19	6.8	4.13	7	4	.685	0-14

(1) Data analyzed in terms of full years (10 yrs. = 9 yrs. 6 mos. through 10 yrs. 5 mos.); half year data obtained by interpolation.

(2) Best fitting exponential curve used (Score = $\sqrt{69.556 \text{ (yr.)} - 370.311}$)

FIGURE 2.31B
BLAT Means and Standard Deviations, by Age



15 learning quotient points equivalent to the respective standard deviations of conventional interpolations were made for intervening learning quotients. Table 2.31C presents learning quotient equivalents for the various raw scores at age levels 6 through 16. (Refer to Table 2.31C as on pg. 52) It should be noted that BLAT learning quotients of only 70 to 79 were thus obtainable for the age levels at 9-1/2 years and below, the minimal one being only 63. Maximum learning quotients do not exceed 145 through the 12-1/2 year level, and shrink to 130 at the 15-1/2-16 year level.

For convenience, Table 2.31D presents BLAT raw score equivalents, by age, at 15-point learning quotient intervals.

TABLE 2.31D
BLAT Raw Scores, by Age, at 15-Point LQ Intervals

	Chronological Age																	
LQ	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½ 12	12½	13	13½	14 14½	15	15½ 16
145	19	24	32	33	34	39	40	41	42	43	47	48	49					
130	15	19	25	26	27	31	32	33	34	35	38	39	40	43	44	45	48	49
115	11	14	18	19	20	23	24	25	26	27	29	30	31	33	34	35	37	38
100	7	9	11	12	13	15	16	17	18	19	20	21	22	23	24	25	26	27
85	3	4	4	5	6	7	8	9	10	11	11	12	13	13	14	15	15	16
70								1	2	3	2	3	4	3	4	5	4	5

TABLE 2.31C
BLAT Learning Quotients by Half-Years

	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½-12	12½	13	13½	14-14½	15	15½-16
49													145	139	137	136	131	130
48												145	143	137	136	135	130	129
47											145	143	142	136	135	133	129	127
46											143	142	140	135	133	131	127	126
45											142	140	138	133	131	130	126	125
44											140	138	137	131	130	128	125	123
43										145	138	137	135	130	128	127	123	122
42									145	143	137	135	133	128	127	126	122	120
41								145	143	141	135	133	132	127	126	124	120	119
40							145	143	141	139	133	132	130	126	124	122	119	117
39						145	143	141	139	137	132	130	128	124	122	121	117	116
38						143	141	139	137	136	130	128	127	122	121	120	116	115
37						141	139	137	136	134	128	127	125	121	120	118	115	114
36						139	137	136	134	132	127	125	123	120	118	116	114	112
35						137	136	134	132	130	125	123	122	118	116	115	112	111
34					145	136	134	132	130	128	123	122	120	116	115	113	111	110
33				145	143	134	132	130	128	126	122	120	118	115	113	112	110	108
32			145	143	141	132	130	128	126	124	120	118	117	113	112	111	108	107
31			143	141	139	130	128	126	124	122	118	117	115	112	111	109	107	105
30			141	139	136	128	126	124	122	121	117	115	113	111	109	107	105	104
29			139	136	134	126	124	122	121	119	115	113	112	109	107	106	104	102
28			136	134	132	124	122	121	119	117	113	112	110	107	106	105	102	101
27			134	132	130	122	121	119	117	115	112	110	108	106	105	103	101	100
26			132	130	128	121	119	117	115	113	110	108	107	105	103	101	100	99
25			130	128	126	119	117	115	113	111	108	107	105	103	101	100	99	98
24		145	128	126	124	117	115	113	111	109	107	105	103	101	100	99	98	96
23		142	126	124	121	115	113	111	109	107	105	103	102	100	99	97	96	95
22		139	124	121	119	113	111	109	107	106	103	102	100	99	97	95	95	93
21		136	121	119	117	111	109	107	106	104	102	100	98	97	95	94	93	92
20		133	119	117	115	109	107	106	104	102	100	98	97	95	94	93	92	90
19	145	130	117	115	113	107	106	104	102	100	98	97	95	94	93	91	90	89
18	141	127	115	113	111	106	104	102	100	98	97	95	93	93	91	89	89	88
17	137	124	113	111	109	104	102	100	98	96	95	93	92	91	89	88	88	86
16	133	121	111	109	106	102	100	98	96	94	93	92	90	89	88	87	86	85
15	130	118	109	106	104	100	98	96	94	93	92	90	88	88	87	85	85	84
14	126	115	106	104	102	98	96	94	93	91	90	88	87	87	85	84	84	83
13	122	112	104	102	100	96	94	93	91	89	88	87	85	85	84	82	83	81
12	118	109	102	100	98	94	93	91	89	87	87	85	83	84	82	80	81	80
11	115	106	100	98	96	93	91	89	87	85	85	83	82	82	80	79	80	78
10	111	103	98	96	94	91	89	87	85	83	84	82	80	80	79	78	78	77
9	107	100	96	94	91	89	87	85	83	81	82	80	78	79	78	76	77	75
8	103	97	94	91	89	87	85	83	81	79	80	78	77	78	76	74	75	74
7	100	94	91	89	87	85	83	81	79	78	78	77	75	76	74	73	74	73
6	97	91	89	87	85	83	81	79	78	76	77	75	74	74	73	72	73	71
5	93	88	87	85	83	81	79	78	76	74	75	73	72	73	72	70	71	70
4	89	85	85	83	81	79	78	76	74	72	73	72	70	72	70	69	70	69
3	85	82	83	81	79	78	76	74	72	70	72	70	68	70	69	67	69	68
2	82	79	81	79	76	76	74	72	70	68	70	68	67	69	67	65	68	66
1	78	76	79	76	74	74	72	70	68	66	68	67	65	67	65	64	66	65

2.32 Sub-Analyses

2.321 By Sex. Presented in Table 2.321, p. 54, are not only the means and sigmas of the BLAT scores (N=961), by age (up to the 19 year level although BLAT Learning Age and Learning Quotients are provided only through age 16), but also the means and sigmas of the Hayes-Binet mental ages (N=663) and of the WISC verbal test ages (N=522). Inspection of the graphic depiction of the BLAT data, Figure 2.321A, p. 55, reveals no consistent differences between the means and standard deviations across age. (No statistical computations were made with respect to these differences.)

Of no particular significance here, but of possible interest in a later discussion, is Figure 2.321B, p. 56, which shows the average scores earned on the three measures of learning aptitude for the age levels 6 through 16. A suspicion will be explored later that the lack of smoothness in the rise in the BLAT curve may reflect a bona fide psychological phenomenon rather than a psychometric aberration.

2.322 By Race. As shown in the earlier information on the BLAT standardization population, a dichotomy of white and non-white is employed, since the non-white category includes three American Indian children on the basis of the acculturation information obtained on them. Since no non-white children below the age of 6 were in the standardization population, comparative data are analyzed for the age range 7 through 17. Shown in Figure 2.322 are line graphs depicting the mean BLAT scores for the two categories, from age 7 through 17, for the total standardization population and for the southern population. Generally, the average BLAT raw scores for the southern whites and non-whites show no marked and consistent differences in favor of either group, although at seven of the 11 age levels the average scores of the whites exceed somewhat those of the non-whites. Since the numbers of subjects at the different age levels range from 3 to only 15, conclusions regarding differences between the groups are not warranted. Since the southern population was entirely a residential school population, the operation of unique selective factors must be recognized. In the case of the total sample, however, BLAT average scores of the white category tended consistently to be higher than those for the non-white category. The significance of this difference was unexplored. For the curious, the raw data from which these line graphs were drawn are presented in Table 2.322A, p. 58.

While not contributive to the standardization of BLAT per se, the differences between BLAT raw scores, for the two categories, can be perceived in terms of the differences between Hayes-Binet mental ages and WISC Verbal (computed) mental ages for the two categories may be seen in Table 2.322B, p. 59. Inspection of these data, or a plotting of them to reflect possible differences between the two categories, will reveal that, generally, as both the Hayes-Binet and the WISC, the means of the non-white tend closely to approximate minus one standard deviations of the white and that the means of the white group tend to

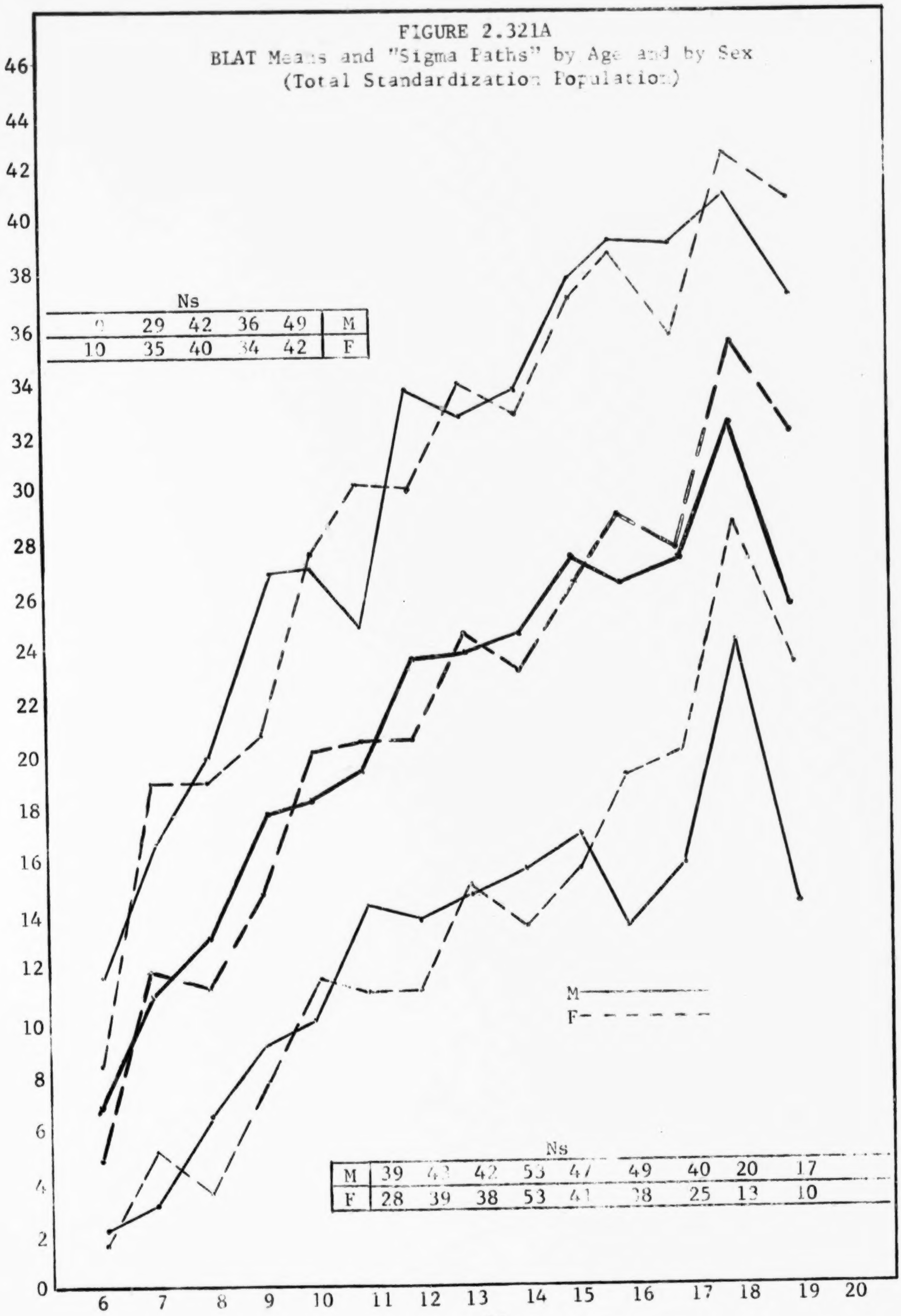
TABLE 2.321

Means and Sigmas of BLAT Scores, Hayes-Binet Mental Ages (in months), and WISC Test Ages (in months) by Age and Sex

Chron. Age	Sex	BLAT			Hayes-Binet			WISC		
		N	Mean Score	σ	N	Mean M.A.	σ	N	Mean T.A.	σ
6	M	9	4.8	3.4	3	68.0	(4.4)*	2	70.0	--
	F	10	6.9	4.8	4	71.5	(28.8)	1	50.0	--
7	M	29	12.0	6.9	12	77.1	12.2	3	80.0	(20.0)
	F	35	9.9	6.8	18	81.0	17.7	4	67.3	6.8
8	M	42	11.2	7.7	22	86.1	22.8	11	77.0	17.8
	F	40	13.0	6.7	21	98.5	17.2	7	75.6	8.3
9	M	36	14.2	6.4	26	108.7	27.4	12	97.3	23.4
	F	34	18.0	9.0	13	111.1	26.1	5	103.4	14.2
10	M	49	19.6	7.9	36	112.0	26.6	23	107.8	27.0
	F	42	18.4	8.5	23	111.5	33.1	15	106.7	33.7
11	M	39	20.5	9.6	28	126.4	36.8	16	113.3	31.9
	F	28	19.4	5.2	19	129.7	30.4	14	122.1	24.1
12	M	43	20.3	9.5	38	129.3	39.6	28	129.0	38.7
	F	39	23.6	10.1	25	138.7	43.7	27	130.7	32.3
13	M	42	24.3	9.6	33	145.8	33.0	31	148.4	30.7
	F	38	23.3	9.0	30	144.9	40.0	26	146.4	36.4
14	M	53	22.9	9.5	47	147.0	37.6	45	156.0	32.5
	F	53	24.7	9.0	45	151.6	32.5	36	154.3	30.1
15	M	47	26.3	10.7	41	155.8	40.9	33	166.8	37.4
	F	41	27.3	10.5	32	170.7	53.3	29	179.2	37.6
16	M	49	28.6	10.0	36	165.5	41.8	35	188.4	31.2
	F	38	26.1	13.2	30	168.8	49.6	34	177.4	46.3
17	M	40	27.6	8.0	28	170.5	29.8	27	185.9	32.5
	F	25	27.3	11.6	21	176.0	48.0	20	179.9	39.5
18	M	20	35.5	7.1	7	178.6	34.5	12	201.3	36.8
	F	13	32.3	8.3	10	178.1	27.6	9	206.9	31.0
19	M	17	32.2	8.9	9	169.1	26.8	10	199.2	25.3
	F	10	25.8	11.4	6	166.8	50.8	7	163.7	58.2

* Values in parentheses are of dubious meaning because of the small N's.

FIGURE 2.321A
BLAT Means and "Sigma Paths" by Age and by Sex
(Total Standardization Population)



Ns

9	29	42	36	49	M
10	35	40	34	42	F

Ns

M	39	43	42	53	47	49	40	20	17
F	28	39	38	53	41	38	25	13	10

FIGURE 2.321B
LEARNING APTITUDE MEANS ACROSS AGE

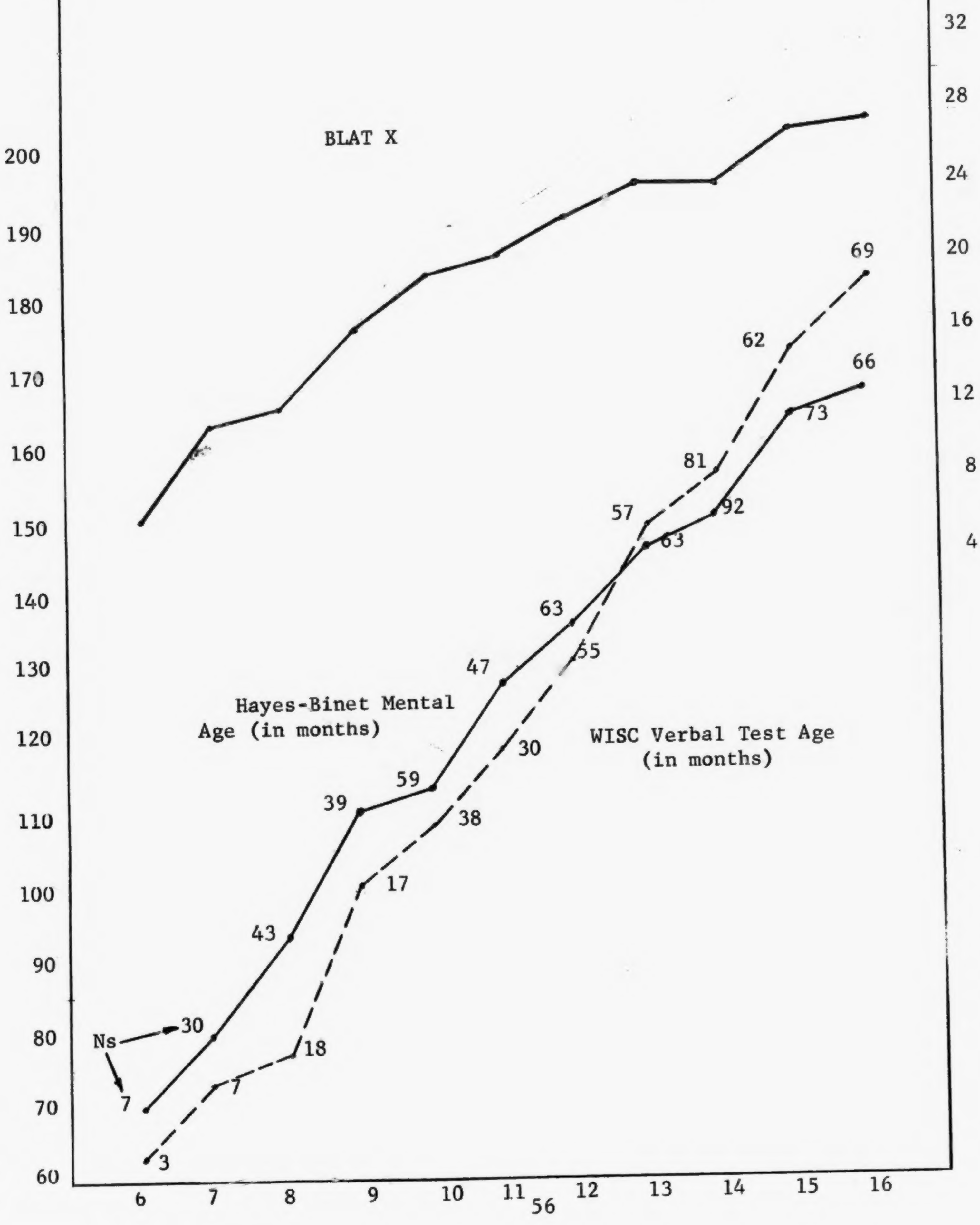


FIGURE 2.322
BLAT Means, by Age, for White and Non-White Subjects

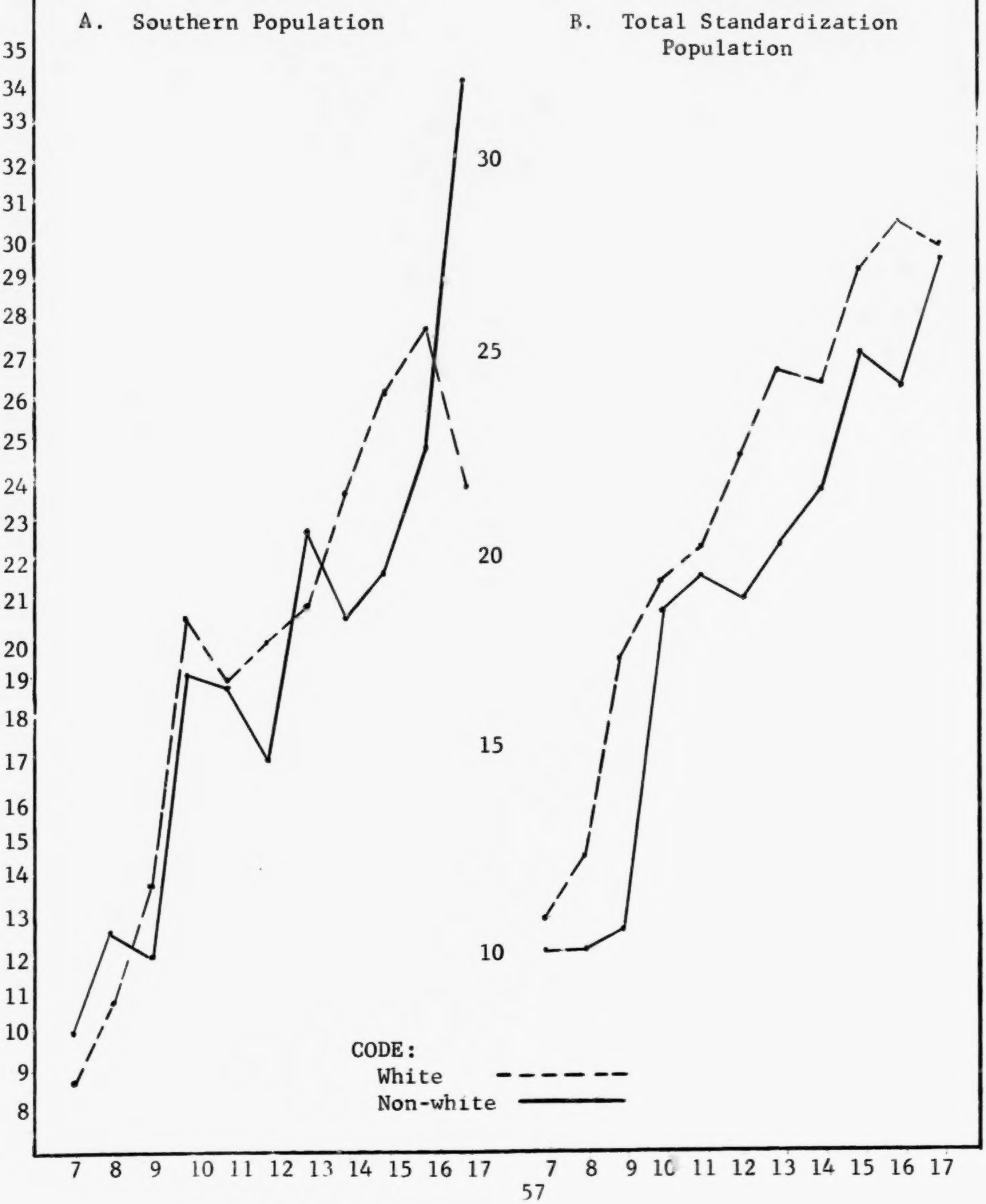


TABLE 2.322A

BLAT Means, Standard Deviations, and Ns for Total Standardization Population and for Southern Population, for White and Non-White Subjects, ages 7 through 17

Age	Total Standardization Population						Southern Population					
	White			Non-White			White			Non-White		
	M	σ	N	M	σ	N	M	σ	N	M	σ	N
17	27.42	9.70	57	27.75	7.78	8	23.83	10.78	18	34.00	4.69	4
16	28.30	11.61	70	24.18	10.81	17	27.56	13.41	27	24.70	11.58	10
15	27.21	10.66	70	25.00	10.31	18	25.87	12.02	32	21.50	8.30	12
14	24.24	9.53	88	21.67	7.54	18	23.31	9.78	48	20.27	7.34	15
13	24.52	8.80	67	20.15	11.00	13	20.76	9.37	26	22.54	11.35	13
12	22.39	9.83	70	18.92	9.81	12	19.74	9.04	31	16.75	10.36	8
11	20.10	8.30	58	19.33	6.18	9	18.85	10.75	13	18.57	6.92	7
10	19.18	8.64	74	18.50	5.92	17	20.40	8.22	15	19.00	6.40	14
9	17.17	8.07	58	10.50	4.40	12	13.78	8.56	9	11.86	4.71	7
8	12.31	7.36	73	10.00	5.92	9	10.75	8.63	16	12.50	4.20	6
7	10.89	7.06	59	10.00	4.80	5	8.25	6.20	12	10.00	4.58	3
N			744			138			247			99

TABLE 2.322B

Hayes-Binet and WISC Verbal Average Ages, by Age Level, and by White and Non-White Subjects, in Southern Population

Age	Hayes-Binet Age*						WISC Verbal Age*					
	White			Non-White			White			Non-White		
	M	σ	N	M	σ	N	M	σ	N	M	σ	N
17	157.7	38.2	17	173.5	42.3	4	186.2	38.8	17	185.0	40.6	4
16	169.7	46.6	27	137.7	34.9	10	187.0	45.4	27	156.5	31.1	10
15	160.8	45.1	32	131.9	31.1	12	170.6	41.2	32	148.0	26.1	12
14	151.3	38.4	47	120.7	22.7	15	154.9	30.1	47	130.6	22.0	15
13	140.7	38.0	26	120.0	27.5	13	140.6	32.1	26	126.8	19.9	13
12	129.4	44.3	31	99.5	24.1	8	127.2	32.4	31	99.4	21.9	8
11	114.2	31.2	13	100.0	23.8	7	109.0	27.0	13	103.0	20.8	7
10	110.5	33.7	15	95.8	21.1	14	105.9	27.4	15	97.5	15.5	14
9	116.3	37.0	8	83.4	9.5	7	100.0	21.5	8	94.7	9.4	4
8	83.4	21.2	12	77.0	13.3	5	73.6	14.5	6	71.3	11.0	4
7	68.5	14.4	8	74.0	7.2	3	78.0	5.7	2	65.0	6.2	3
N			236			98			224			94

* Hayes-Binet mental ages and WISC Verbal ages (computed) are expressed in months.

approximate plus one standard deviation of the non-white group. To be determined later is the fact that such pronounced differences do not exist in the case of the BLAT means and standard deviations even in the case of the rather consistent differences - across age - in the total standardization population.

2.323 By Kind of School. Shown in Table 2.323, p. 61, are learning aptitudes test results for children in residential and in day schools. On p.62 are line graphs of the means, plotted over the age range 7 through 17. No statistically significant differences (at the .05 level) were found between the scores for the two kinds of schools on BLAT. In the case of the Hayes-Binet results the difference was significant only between the .10 and .25 levels. Too few day school children had been tested by the WISC to warrant such computation on even an exploratory basis.

2.324 By Geographic Area. Shown graphically in Figure 2.324, p. 63, are the average raw scores on BLAT, over the age range 7 through 17 for the three geographic sub-samples - the midwest, the coastal, and the southern subjects. As would be expected from data already presented, the southern sample tended to score somewhat lower than did the others.

2.325 By Southern School and Achievement. Shown in Table 2.325A are average data on those children in the three southern schools who took the achievement tests. While comparisons of achievement among the schools can be made on the basis of these data, they reflect, in a gross but suggestive way, relationships among the different learning aptitude level indications. For Alabama, the average learning age indicators are in considerable agreement - all falling in the latter half of the eleventh year. For the Tennessee school, the BLAT average learning age appears to be about a year higher than that suggested jointly by the Hayes-Binet and the WISC Verbal. In the North Carolina group, the BLAT results disagree with the Hayes-Binet and WISC Verbal by two years. The lowness of the average achievement scores in the Tennessee school limits any attempt at judging the predictive values of the tests of learning aptitude.

When the average data for the different sub-groupings by chronological age (9-11, 12-13, and 14 up) are inspected in a comparable manner, the BLAT learning age equivalents appear to increase, within each school, as might be expected in view of the prior sectioning in terms of C.A., but the younger group in the North Carolina school scored relatively higher on BLAT than they did on the Hayes-Binet or on the WISC Verbal. Yet the achievement test performances are more what we would expect on the basis of the Hayes-Binet and WISC tests. Again, the achievement test data in the Tennessee school reflect no patterning as do those for both the Alabama and the North Carolina schools. (The lack of a systematic approach to this achievement testing in the Tennessee school has been noted.) (Table 2.325B, p. 65)

TABLE 2.323

Means, Sigmas, and Numbers of Subjects, by Chronological Age, on BLAT, Hayes-Binet, and WISC (Verbal) for Residential and Day School Populations

	RESIDENTIAL				DAY SCHOOL			
CA	M	S.D.	N		M	S.D.	N	
BLAT (Raw Scores)								
19	33.85	8.67	13		21.25	10.06	4	
18	34.13	7.68	31		35.50	(3.50)	2	
17	26.77	9.65	53		30.50	7.18	12	
16	27.75	11.25	73		26.14	12.36	14	
15	26.51	10.52	75		28.23	10.31	13	
14	23.82	9.26	93		23.69	8.70	13	
13	23.82	9.36	72		23.75	7.61	8	
12	21.19	9.97	68		25.21	8.07	14	
11	19.80	8.31	51		20.63	6.69	16	
10	19.85	8.07	68		16.65	7.82	23	
9	14.50	5.78	44		18.62	10.04	26	
8	11.18	7.28	57		14.08	6.51	25	
7	9.59	6.58	39		12.76	6.77	25	
6	4.15	2.48	13	(N=750)	9.67	4.46	6	(N=201)
Hayes-Binet (Mental Ages - in months)								
19	187.00	24.51	7		173.00	(29.70)	2	
18	180.50	29.08	16		143.00	--	1	
17	170.67	39.00	40		182.67	35.43	9	
16	164.13	42.10	55		181.36	58.47	11	
15	158.18	44.14	62		185.73	57.37	11	
14	148.01	36.11	81		158.36	25.98	11	
13	143.45	33.87	56		161.00	51.97	7	
12	128.30	41.52	53		158.10	29.96	10	
11	120.03	33.04	35		150.17	27.02	12	
10	110.94	29.81	48		115.54	26.30	11	
9	107.48	27.74	27		114.08	24.43	12	
8	86.85	20.75	27		101.06	18.76	16	
7	70.23	11.68	13		86.47	14.78	17	
6	81.00	20.31	4	(N=524)	55.33	9.50	3	(N=133)
WISC Verbal (Computed Test Ages - in months)								
19	200.29	32.87	7		139.00	--	1	
18	203.67	33.73	21		--	--	--	
17	183.36	36.56	44		183.00	65.57	3	
16	183.83	39.50	65		169.75	42.53	4	
15	171.66	37.16	59		191.33	52.37	3	
14	154.83	31.28	80		189.00	--	1	
13	146.04	32.73	55		187.00	(15.56)	2	
12	128.70	34.71	54		191.00	--	1	
11	118.31	28.44	29		91.00	--	1	
10	106.88	30.06	36		115.50	(14.85)	2	
9	98.25	21.25	16		112.00	--	1	
8	74.76	13.10	17		105.00	--	1	
7	71.50	8.53	6		80.00	--	1	
6	70.00	(2.83)	2	(N=491)	50.00	--	1	(N=22)

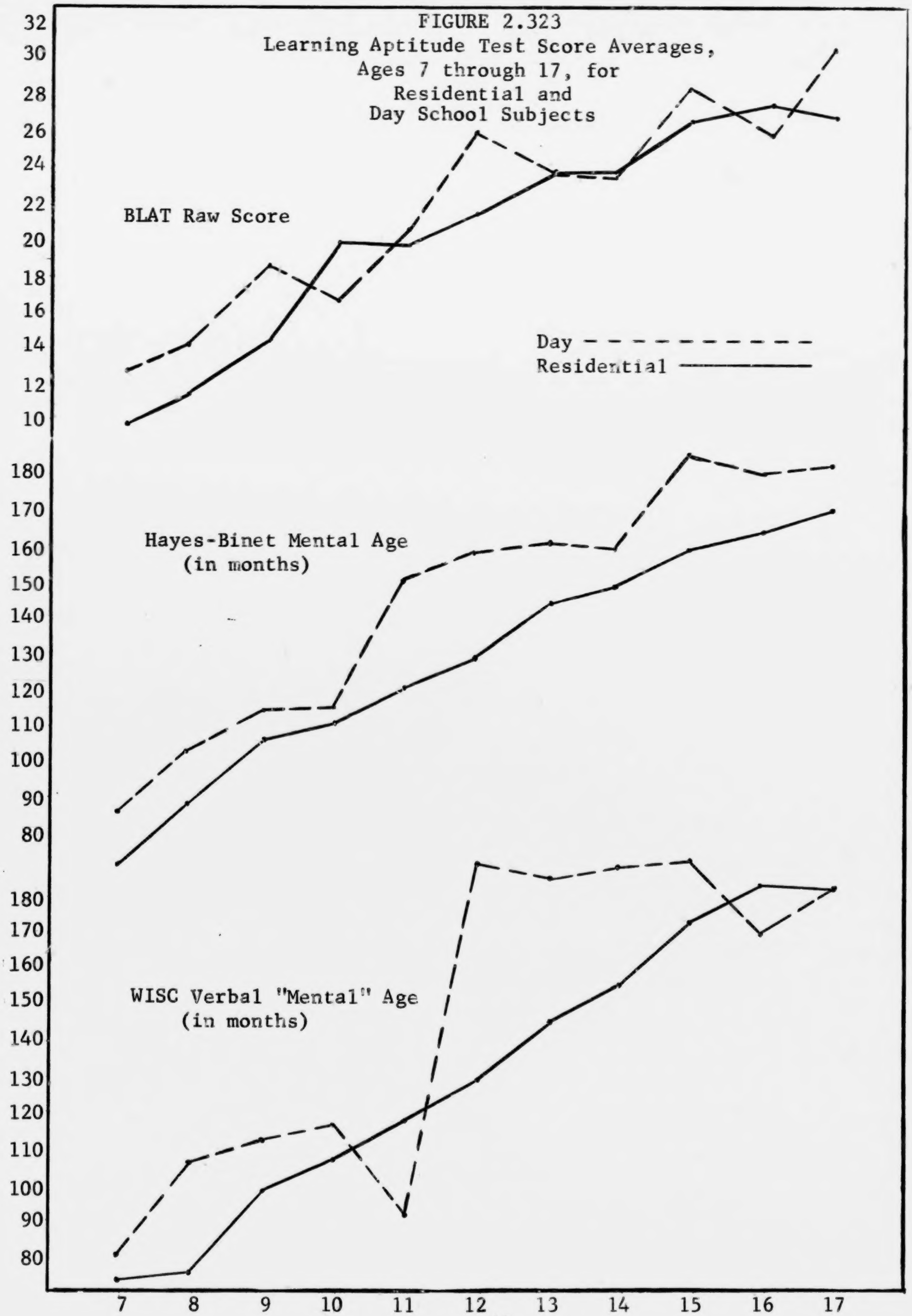


FIGURE 2.323
Learning Aptitude Test Score Averages,
Ages 7 through 17, for
Residential and
Day School Subjects

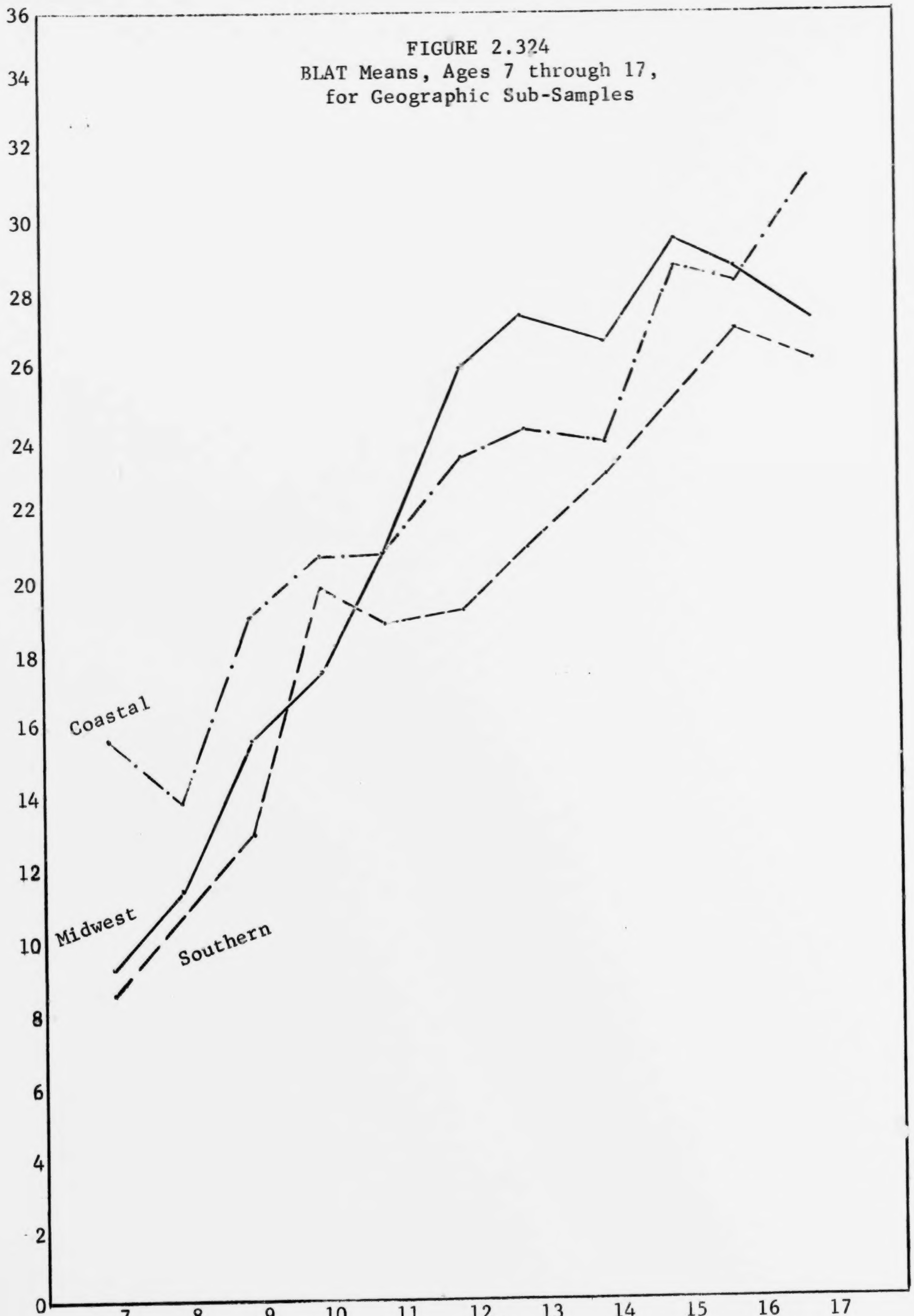


FIGURE 2.324
BLAT Means, Ages 7 through 17,
for Geographic Sub-Samples

TABLE 2.325A

AVERAGE DATA FOR THOSE TAKING ACHIEVEMENT TESTS

	ALABAMA	TENNESSEE	NORTH CAROLINA
C.A.	153 (12-9) 76	156 (13-0) 76	165 (13-9) 110
H-B.M.A.	138 (11-6)* 76	133 (11-1) 74	149 (12-5) 110
W.V.T.A.	142 (11-10) 76	142 (11-10) 72	153 (12-9) 109
BLAT X	21 (11½-12) 76	22 (12½) 76	24 (14-14½) 110
Wd. Mean.	6.8** 74	3.6 41	5.3 74
Par. Mean.	5.1 74	4.5 67	6.4 110
Spelling	6.4 74	6.0 45	7.3 110
Ar. Reas.	5.4 7.5		
Ar. Comp.			5.8 109
Ar. Conc.			6.3 110
Ar. Appl.			7.2 89

* Hayes-Binet Mental Age of 153 months, or 12 years 9 months. N=76

** 8th month, 6th grade. N=74

TABLE 2.325B

AVERAGE DATA FOR THOSE TAKING ACHIEVEMENT TESTS
BY CHRONOLOGICAL AGE SUB-GROUPS

	ALABAMA			TENNESSEE			NORTH CAROLINA		
	9-11	12-13	14 up	9-11	12-13	14 up	9-11	12-13	14 up
H.B.M.A.	112(9-4)* 15	135(11-3) 20	163(13-6) 34	110(9-2) 14	125(10-5) 18	148(12-4) 39	125(10-5) 14	145(12-1) 27	156(13-0) 68
W.V.T.A.	110(9-2) 15	135(11-3) 20	175(14-7) 34	101(8-5) 14	129(10-9) 18	164(13-8) 39	117(9-9) 14	140(11-8) 27	165(13-9) 68
BLAT X	19(10½)** 15	21(11-11½) 20	24(13½) 34	18(10) 14	20(11) 18	26(15) 39	24(13½) 14	23(13) 27	26(15) 68
Wd.Mean.	4.8*** 13	6.4 20	8.6 34	3.5 12	4.0 14	3.3 13	4.7 14	5.9 27	5.1 32
Par.Mean.	3.6 15	4.8 19	6.2 34	2.5 13	4.0 17	5.8 33	3.9 14	6.1 27	7.0 68
Spelling	5.1 14	5.8 20	7.9 33	6.8 2	6.2 12	5.8 31	4.9 14	6.4 27	8.2 68
Ar.Reas.	3.7 14	4.7 20	7.3 34	-	5.5 4	7.2 23			
Ar.Comp.							3.2 14	5.1 27	6.6 67
Ar.Conc.							4.3 14	5.8 27	7.0 68
Ar.Appl.							6.7 4	6.7 23	7.4 61

* 112 months, or 9 years 4 months. N=15: ** 10½ months test age on basis of BLAT norms;
*** 8th month, 4th grade. N=13.

2.33 Reliability. Two kinds of evidence reflect favorably on the reliability of BLAT. Using the Kuder-Richardson Formula 14, the reliability on the 961 cases over the total age range was found to be .934 - suggesting a high consistency among the 49 items making up the (untimed) test.

On the basis of retesting 93 children, aged 6 through 16 years, seven months after the original testing, a test-retest reliability of .865 was found. Seven different testers did the retesting with no knowledge of the results originally obtained by seven original testers. None of the retesters had previously administered BLAT; in fact, only two of the original testers (who had tested a total of 9 children in this respect of the study) had had prior experience with BLAT.

From the standpoint of a maximum "reality" situation in retesting for reliability information, the conditions which maintained with respect to the retesting of all 93 children by the seven retesters can be regarded as quite "real". Even though the testers and the retesters had been given orientation training in the administration of BLAT, there were bound to be discernible differences among them in obtaining rapport with the children, in involving the children in the solution of the items both during and after the practice items in both testings, and, at times, in pressing for responses in the hope that the most thoughtful responses could be elicited from children who seemed to be "flighty", careless, bored, or in some way distracted.

Yet, a curiosity existed regarding the possibility that some testers, by some quirk in administering or scoring BLAT, might have obtained scores the validity of which might be questioned. The test scores on the 93 children, therefore, were examined by seeking the answers to two questions:

a) Taking the raw scores earned on the original testing of these 93 children, what were the magnitudes of change, among the seven original testers, from the original testing to the retesting? While differences reasonably could be expected among the original testers, the median changes ought not differ to any major degree.

b) Taking the raw scores earned on the retesting of those 93 children, what were the magnitudes of change, among the seven retesters, from the original testing to the retesting?

This analysis revealed an interesting condition. The median gains from those scores obtained by each of the original testers were 4, 5, 5, 6, 6, 6, and 7, suggesting a not unreasonable amount of variation. However, when the retest scores were analyzed in terms of the magnitudes of the gains in the retest scores among the retesters, the median gains were 3, 4, 5, 5, 6, 8, 5, 11, and 12. This invited curiosity, if not concern, regarding the validity of the retesting procedures of the two retesters whose subjects (12 all told) had median gains of 11 and 12. No selective factors were known to have been operative in allocating retest S's to these two retesters. If, then, the test-retest reliability were computed on only the remaining 81 children (eliminating the results obtained by the two most deviant retesters), this might give a "purer" (though perhaps somewhat less "real") picture of the reliability of BLAT. This Pearson coefficient turned out to be .888 for the age range from 6 to 16, a negligible gain over the original .865.

In order to ascertain whether a difference existed between the test-retest reliability of the younger children and that for older children, the reliabilities were computed for those in the 6-10 year range and also for those in the 12-16 year range. These Pearson coefficients were .871 for the 24 children in the lower age range and .895 on the 53 subjects in the upper age range, suggesting no major difference in terms of such age levels.

Whether the evidence of test-retest reliability is perceived in terms of the results obtained on the 93 cases (r=.865) or in terms of what might be regarded as a "purer" sample N=81; r=.888), it would appear that BLAT has reasonable test-retest reliability.

It should be borne in mind that the correlational approach involved here throws light primarily on the degree of agreement in the orderings of the populations under the two conditions of testing. The psychometric information communicated by a reliability coefficient may create a false sense of security with respect to the possible educational uses of the results so correlated. A given coefficient may reflect any one of three relationships which might exist between the two sets of data on the same group.

Most commonly, the magnitudes of the raw scores obtained in the two testings are reasonably comparable, with no significant trends of increase or decrease of the second scores in comparison with the initial scores. Barring the phenomenon of regression, this is the case with most "intelligence" and achievement tests which are readministered after a short period of time. The use of the retest results gives pretty much the same predictive ("intelligence") or descriptive (achievement) characterizations of the children. (Regression should be recognized as a statistical phenomenon, at times of limited relevance psychoeducationally, and in most clinical instances inapplicable.)

But two additional possibilities exist where the results of the two testings would correlate highly. On the one hand, the scores on the second testing may be consistently lower - most children earning lower scores in the second testing, although not necessarily by the same magnitudes, and the ordering of the children on the two testings remaining essentially similar. On the other hand, the reverse may be true - generally higher scores being earned on the second testing, though not necessarily by the same magnitudes, and the orderings remaining essentially similar. So long as test scores are merely recorded on cumulative folders and nothing is done educationally for the children in the light of those scores, no problem becomes apparent. However, if a teacher seeks to adapt her instruction to a child in terms of the results of, say, "intelligence" test results, she will be at a loss to decide how to proceed. Under the first of the two possibilities here, she may find that a child has earned on the first testing a mental age (or test age) of 9 years 0 months and on the second testing a test age of 8 years 0 months. Should she try to work with the child as a beginning fourth grader or as a beginning third grader? The reverse of this condition would exist in the case of the second of these two possibilities mentioned - generally higher scores on the second testing.

This general problem is identified here because in the BLAT retesting, with the reliability of .865, there was a median gain of 5.8 points (mean=5.6) from first to second score (using the results of all seven retesters). To the extent that the statistical phenomenon of regression would be operative, to that extent would one expect the median (or mean) differences between original test scores and retest scores to approach zero. The regression phenomenon appears not to be operating here. However, it is quite possible that the kinds of behavior sampled by BLAT are different from those sampled by most tests - especially those of achievement and probably most of those of "intelligence". The psychological "process" or processes, sampled by BLAT may quite properly be more susceptible to the kind of practice provided by the first testing.

The fact that, for those 81 children presumably more carefully retested, the median retest scores on BLAT were 4.5 higher than the scores earned in the first testing is, of itself, no unusual phenomenon. With respect to practice effects of the Primary Abilities Tests, for instance, the observation has been made that "mean scores are usually higher on the second administration." (Technical Report, PMA, 1965, p. 16) (It should be noted that there probably is a closer resemblance between the kinds of behavior being sampled by BLAT and the PMA - particularly at the lower levels than there is between BLAT and most verbal tests of "intelligence".)

However, the question seems not generally to have been raised as to which of the two scores, on any test of learning aptitude, better suggests the learning aptitude of the children so tested.

This matter seemed worthy of exploration in regard to BLAT, or in regard to tests involving comparable kinds of behavior sampling, for the following reasons: (1) Blind (and other disadvantaged) children tend, more often than do any others except, probably, deaf children, to come from environments that are clearly less nurturant to the product aspect of learning aptitude; perhaps due to decreased visual feedback in their acts of learning, the process aspect of learning aptitude may be similarly impaired. (2) If the act of taking BLAT stimulates, and in fact trains in connection with the training items for each series, and if this training has the effect of "awakening" or causing to operate more effectively those aspects of process tapped by BLAT, the retest, and probably higher, score may be a better predictor of academic achievement than the initial BLAT score. Since there were available not only the retest scores but also some educational achievement test scores, it was possible to ascertain the "predictive" correlations in this manner. Should these latter correlations turn out to be significantly or discernibly higher than the comparable correlations involving the initial test scores, one implication well could be that blind children should be tested twice by BLAT in order to get a more valid indication of their learning potential. Unfortunately, the small number of cases with respect to which this exploration could be made would necessarily limit any generalizing in this regard.

To explore this aspect of the problem the BLAT scores obtained on the first testing and on the second testing (using data obtained by only the five retesters who were not regarded as "deviant") were correlated with achievement test scores in paragraph meaning, on arithmetic concepts, and on spelling. The product moment correlations thus obtained are shown in Table 2.33A, below. No difference is apparent in the correlations when BLAT test and retest scores were used. However, these scores were earned by children ranging in age from 6 through 16. It still may be that a different picture would emerge if separate correlations were computed for younger and for older children. Even though a very limited ceiling effect appeared to be determining the magnitudes of increases in scores, children under 11 years of age gained a median of 6.5 points from test to retest whereas the median gains for children 12 and above was only 3.5 points, as shown in Table 2.33B, below.

TABLE 2.33A
Product Moment Correlations Between BLAT Test and Retest Scores with Stanford Achievement Test Scores

BLAT	Paragraph Meaning	Arithmetic Concepts	Spelling
Test	.72	.82	.47
Retest	.74	.79	.44
N	63	25	42

TABLE 2.33B
BLAT Median Retest Score Gains by Chronological Age

Age	6	7	8	9	10	11	12	13	14	15	16
Median Gain	7.0	7.0	5.0	6.5	4.5	6.0	7.0	5.0	3.5	3.0	3.5

As has been shown, BLAT makes six ostensibly different kinds of behavior sampling. Analyses were made in order to ascertain whether the gains in retest scores were associated with performances in particular kinds of behavior sampling. In an overall sense, increased retest scores tended to occur among those Ss who made zero scores on the different kinds of items (regression or nurturance?), although most of those who did correctly all the items sampling recognition of identities were among those who earned higher retest scores. A more intensive study of the relationship between score increase and the kinds of behavior sampled could throw much helpful light with possibility of the nurturance of psychological process(es), or perhaps only in the performance of psychometric regression.

2.34 Factor Analysis of BLAT. As shown in Appendix C, a common factor accounts for 38.56 of the variance in performance on BLAT. Three other factors contribute discernibly; an a:b::c:d factor (12.21), an identification of similarities and differences (11.35), and what appears to be a pattern completion factor (10.02).

2.35 BLAT Correlations with Other Measures

2.351 With Hayes-Binet and WISC. Presented in Table 2.351A, below, are the product moment correlations between BLAT raw scores and the mental ages on the Hayes-Binet and WISC Verbal (computed) test ages, broken down into pre-project and project populations. The WISC data on the pre-project group invite least confidence. The higher correlation between Hayes-Binet and WISC on the project population, as contrasted with that on the pre-project population, probably results from more uniform testing procedures employed on the project. The fact that, generally, BLAT results correlated lower with Hayes-Binet and WISC than the latter two correlate between themselves is taken to support the belief that, while the three tests sample considerably in common, BLAT samples also something else. The consistency of this pattern is shown in similar correlations within the three school populations in the project. (Table 2.351B)

TABLE 2.351A
Correlations Between Learning Aptitude Measures on
Pre-Project, Project, and Total Populations

		Hayes-Binet	WISC
Pre-Project	BLAT	.73(328)*	.61(202)
Population	H-B		.76(103)
Project	BLAT	.75(335)	.73(320)
Population	H-B		.91(317)
Total	BLAT	.74(663)	.71(522)
Population	H-B		.89(420)

*Ns shown in parentheses.

TABLE 2.351B
Correlations between Learning Aptitude Measures on Southern School Populations

		Hayes-Binet	WISC
Alabama	BLAT H-B	.79(76)*	.76(76) .92(76)
Tennessee	BLAT H-B	.68(74)	.77(72) .87(72)
North Carolina	BLAT H-B	.60(110)	.51(109) .88(109)

*Ns shown in parentheses.

2.352 With Achievement Test Results. As has been stated, it had been hoped that the Stanford Achievement Test would be given to all the children from age 9 through 16 in each of the three southern schools. However, such was not possible. A few were not so tested because of absence, illness, or having moved away. Quite a few others were not so tested for reasons best known to the school personnel. In the Tennessee school, a large number just weren't tested. Therefore, not only were the total data fewer than desired, but those data which were available for these analyses reflect probable biases and range restrictions which probably weaken and distort certain implications which may be suggested in the results. For gross analyses, the total Ns are sufficiently large to be strongly suggestive, but for subsequent sub-analyses the Ns become much too small to suggest reasonably clearly the patterns which might otherwise have appeared. White - non-white comparisons were not made because of small Ns. As has been stated earlier, also, scores on only the sub-tests of the Stanford were used in the analyses because total scores on the Stanford were regarded as essentially sterile of psycho-educational significance. Gross (product-moment) correlations, by schools, for the learning aptitude test scores and subject matter area scores will be presented first, followed by similar analyses in terms of age groupings.

Presented in Table 2.352A are the intercorrelations for the learning aptitude measures and Stanford Achievement scores, by schools. It can be seen that the BLAT correlations (Table 2.352A, pg. 72) consistently are lower than the Hayes-Binet and the WISC. The fact that the correlations in the area of spelling are lower than in the other achievement areas is consistent both with other findings in this area, and the fact that the BLAT correlations in this area are lower (with one exception) than the other two suggests raising a question as to the extent to which "process" is essential in the spelling behavior tapped by these tests.

The 1965 study by Hecht had suggested that BLAT might correlate with measured achievement more highly at earlier age levels than at

TABLE 2.352A
Correlations between Learning Aptitude Measures and Stanford Achievement Test Results, by Schools

	BLAT	Hayes-Binet	WISC(V)
	Word Meaning		
Alabama	.69(74)*	.94(74)	.94(74)
Tennessee	.50(41)	.61(40)	.62(40)
North Carolina	.39(74)	.82(73)	.70(74)
	Paragraph Meaning		
Alabama	.73(75)	.88(75)	.84(75)
Tennessee	.71(67)	.82(66)	.84(64)
North Carolina	.51(110)	.90(110)	.81(109)
	Spelling		
Alabama	.70(74)	.80(74)	.82(74)
Tennessee	.40(45)	.42(45)	.30(45)
North Carolina	.41(110)	.75(110)	.70(109)
	Arithmetic Reasoning		
Alabama	.75(75)	.88(75)	.91(75)
	Arithmetic Computation		
North Carolina	.55(109)	.81(109)	.79(108)
	Arithmetic Concepts		
North Carolina	.60(110)	.84(110)	.78(109)
	Arithmetic Application		
North Carolina	.60(89)	.76(89)	.83(88)

* Ns in parentheses.

TABLE 2.352B
Product-Moment Correlations between Learning Aptitude Measures and Stanford Achievement Test Results for the Southern Schools Combined

	Ages 9-11						Ages 12-13						Ages 14-16					
	N	1	2	3	4	5	N	1	2	3	4	5	N	1	2	3	4	5
Wd.Mean.	39	55	72	84	76	84	61	54	84	82	84	81	79	53	86	83	86	83
Par.Mean.	42	58	76	84	81	84	63	60	87	82	87	82	135	59	81	76	82	77
Spelling	30	35	80	75	80	77	59	63	70	67	74	72	132	32	56	49	57	49
Ar.Comp.	14	48	94	83	94	84	27	61	73	69	75	72	67	58	80	72	80	73
Ar.Conc.	14	50	95	88	95	88	31	58	86	77	86	78	91	59	76	68	76	70
Ar.Appl.	4	-	-	-	-	-	23	66	88	86	89	87	61	59	81	74	82	76
Ar.Reas.	14	69	77	70	86	76	20	72	84	86	87	88	34	76	84	83	88	88

Decimals omitted.
Zero order correlations: 1-BLAT; 2-Hayes-Binet; 3-WISC.
Multiple correlations: 4-BLAT and Hayes-Binet; 5-BLAT and WISC.

higher age levels and also that multiple correlations between BLAT and Hayes-Binet combined and between BLAT and WISC combined with measured achievement were higher than other zero order correlations. Therefore, the southern data were so analyzed. Table 2.352B (pg.72) presents the correlations for the age sub-groupings by achievement test area for the three schools combined. The correlations in this table lend support to neither of the possibilities suggested in Hecht's study.

Table 2.352C, below, presents comparable exploratory analyses for each of the southern schools. These data also fail to lend support to the suspicion that BLAT results might have more "predictive" value at the earlier age level. The multiple r's remain unpromising. Inspection of the data on the Tennessee children prompts one to suspect that their extreme variability well may have clouded or distorted the picture for the southern schools when taken as a group.

Not reported here is an unfruitful exploration that was made of the possible merits of obtaining weighted scores on the BLAT. This was done with respect to only the total scores. Something more fruitful might turn up if the weighting of items or of groups of items were explored in terms of their factor loadings.

TABLE 2.352C

Product-Moment Correlations between Learning Aptitude Measures and Stanford Achievement Test Results for the Three Southern Schools

	Ages 9-11						Ages 12-13						Ages 14-16					
	N	1	2	3	4	5	N	1	2	3	4	5	N	1	2	3	4	5
Alabama																		
Wd.Mean.	13	48	90	78	91	78	20	60	91	89	91	90	34	69	93	90	94	90
Par.Mean.	15	71	88	68	89	80	19	72	89	88	90	88	34	71	85	85	85	85
Spelling	14	43	74	76	75	76	20	77	78	78	83	83	33	56	67	67	67	67
Ar.Reas.	14	69	77	70	80	80	20	72	84	86	85	87	34	76	84	83	86	85
Tennessee																		
Wd.Mean.	12	74	43	92	84	93	14	53	83	82	82	82	13	22	42	29	43	28
Par.Mean.	13	63	52	89	80	90	17	65	72	83	76	84	33	66	81	77	82	77
Spelling	2	-	-	-	-	-	12	46	14	44	51	49	31	44	53	38	54	44
Ar.Conc.	0	-	-	-	-	-	4	-	-	-	-	-	23	54	69	58	70	59
North Carolina																		
Wd.Mean.	14	46	90	82	90	83	27	45	84	76	84	76	32	26	72	63	75	63
Par.Mean.	14	47	95	86	95	87	27	56	95	87	94	88	68	52	85	78	85	80
Spelling	14	32	88	74	90	76	27	65	85	75	86	80	68	35	66	60	67	60
Ar.Comp.	14	48	94	83	94	83	27	61	73	69	76	75	67	58	80	72	81	76
Ar.Conc.	14	50	95	88	95	88	27	61	88	81	89	83	68	63	80	72	81	78
Ar.Appl.	4	-	-	-	-	-	23	66	88	86	89	89	61	59	81	74	82	78

Decimals omitted.
Zero order correlations: 1-BLAT; 2-Hayes-Binet; 3-WISC.
Multiple correlations: 4-BLAT and Hayes-Binet; 5-BLAT and WISC.

3. SUMMARY

Starting in 1953 with a long-held conviction that the learning aptitudes of blind children should be sampled in a manner different from that generally in use with respect to sighted, non-disabled children, work was begun on this blind learning aptitude test (BLAT). One component in this conviction was the belief that the cutaneous-kinesthetic input channel should be involved, since it figured importantly in learning by the blind. But a larger factor in the motivation to construct a test such as BLAT was a growing concern that blind children, at least those with whom the author had worked clinically, tended to come from situations in which they had not had as nurturant an acculturation as did the majority of children. As a result, they failed disturbingly often to satisfy an assumption underlying most extant procedures in testing "intelligence", namely that their acculturation was sufficiently comparable to that of most children to make the result of such measurement acceptably valid.

While it might be more nearly customary to profess solemnly here that work on BLAT was initiated and pursued on the basis of a single line of coldly reasoned and firmly adhered-to, formally-stated premises, such was not the case with the development of BLAT. Interestingly, the factor of the presumed importance, if not dominance, of the cutaneous-kinesthetic input of information was verbalized strongly during the early years and decreasingly with time, but, in actual practice (the things perceived as necessary to do and the steps actually taken in the light of that perception), the dominance of the idea of a deviant acculturation in so many blind children became apparent. What was done figured more prominently than what was said.

From the very first, it was decided that this sampling of the learning aptitude of blind children; (1) should tap conventional experiential background as little as possible, (2) should be through the sense of touch, (3) should avoid demanding sensory discrimination as fine as that needed in the reading of braille, and (4) should not evoke responses which would be dependent upon verbal competency. Within this structure, there was an *a priori* commitment to a Spearman-type conceptualization of intelligence.

From a pool of some 350 items which had been used in the testing of "intelligence" of the sighted, plus a few created for this purpose, a pool of 94 possible test items was selected and embossed, after the manner in which brailled reading material is prepared. On the basis of the responses of some 500 educationally blind children, aged 5 to 19, to these items in residential and day schools in five midwestern states, a residual pool of 49 test items and 12 training items was winnowed. Further response data were obtained from blind children in two west coast, two east coast, and three southern states. The total of the responses of 961 functionally blind children in the 12 states constitute the normative data for BLAT. All BLAT testing was done individually by persons who had been trained for that purpose by the author.

Background information on the children, collected at the times of testing, indicate both that the socio-economic distribution of the children reasonably well approximates that for the United States, that the white-non-white distribution is, in an overall sense, quite comparable to that for the United States (although there may be an under-representation of non-southern non-whites), and that the male-female representation is most adequate.

Since the Hayes-Binet and Wechsler Intelligence Scale (WISC) Verbal tests were implicitly challenged as adversely sensitive to the acculturation of blind children, any attempt at validating BLAT concurrently against either of them was avoided. Similarly avoided as criterion were teacher judgments of learning capacity and academic performance, these being regarded as potentially contaminated. Therefore, the presumed construct validity accompanied by discrimination across age was taken as validating evidence. This discrimination is not as "sharp" between successive age levels as might be desired, generally no greater than the standard error of measurement, but compares favorably with that of the Raven Progressive Matrices. (It is interesting to note that both BLAT and the Raven are untimed tests.) BLAT, like the Raven, tends to lose in discriminating power above age 12.

Internal consistency is reflected by a Kuder-Richardson (14) r of .934. Test-retest reliability over a seven-month interval by seven inexperienced graduate student retesters yielded an r of .865.

Within the total standardization population BLAT scores correlated .74 (N-663) with the Hayes-Binet mental ages and with WISC Verbal ages (computed by means of the Verbal IQ) .71 (N-522). However, Hayes-Binet results and WISC results on the 420 of these children on whom both scores were available correlated .89 (N-420). In the group from the three southern states, where all of the testing was done at the same times by the same, or comparably qualified, persons, the correlationa were essentially the same: .75 (N-335); .73 (N-320); and .91 (N-317) respectively.

Although it is believed that a bias existed in the selection of the southern school children who were given the Stanford Achievement Test, the fact that BLAT raw scores tended consistently to correlate somewhat lower with the results obtained on the different parts of that test than did either Hayes-Binet mental ages or WISC Verbal test ages is taken, along with the pattern of correlations just reported, as suggesting that BLAT, while measuring some facet of learning aptitude in common with the two other tests taps something else that may be psychoeducationally valuable. No analyses were made in terms of IQs or learning quotients, since they are less meaningful educationally. Nor were analyses made in terms of "total educational achievement" because more potentially valuable information can be obtained in considering the differing kinds of psychological demands made by the different subtests - for instance, spelling as contrasted with reading comprehension, or arithmetic reasoning vs. arithmetic computation. The achievement test data were regarded as inadequate to warrant the exploration of race or sex differences.

In case anyone may wish to make his own analyses of the data used in this study, a full set of the raw data can be obtained from the author.

He retains, also, a full file of the IBM cards on which the data have been punched.

Research directed toward one objective often has a yield which is peripheral to the original focus of the undertaking. Sometimes that peripheral yield has greater conceptualization value than the anticipated outcome of the research undertaken. Such, it is believed, was true in this case. After not more than five years' work on BLAT, it was discovered that BLAT tended to lose its discriminative power at or near the 12-year level. This was not the result of a "ceiling effect" resulting from a limited number of items. This led to a change in the way in which the results of "intelligence" testing were perceived. In fact, this event in effect precipitated a verbalization and structuring of what had been an intuitive clinical practice on the part of the author as he had been assessing the learning capability of differing kinds of children whose backgrounds had been deviant, particularly in the cognitive area. (These experiences, now seen in retrospect, had been heavily influential in prompting this work on BLAT.)

Comparison of the behaviors sampled by BLAT with those sampled by other "intelligence" tests resulted in a realization that the behavior sampling involved in many "intelligence" tests - particularly those early in the field, had been done in terms of the early-stated principle that one measured achievement and inferred from that achievement an attending capacity to achieve. This necessitated, of course, the assumption of comparable acculturation on the parts of those so tested and evaluated. The more this achievement played a part in such testing instruments the later (in age) did scores on them tend to "peak". Yet there were tests, BLAT and the Raven for instance, which peaked much earlier. These two tests differed from most earlier ones with respect to the kinds of behavior sampled. Achievement, in the grosser sense, played no part, or a very small part, in the discriminative power of such tests. Rather, these tests sampled the fundamental psychological processes which made possible the "achievement" sampled in the majority of tests. BLAT was, then, perceived as sampling at the process end of a "process-product" continuum along which various "intelligence" tests could be placed. This is relatable, for instance, to Cattell's "fluid-crystallized" general abilities continuum, or dichotomy, to Spearman's "g" (essentially "process" in the terminology employed here), or to the author's perception of Guilford's "operations".

The perception of BLAT in terms of its sampling a "process", rather than a "product" kind of behavior, makes the results of this research more understandable than if BLAT were regarded as just another "intelligence" test. The correlation between BLAT results and those on the Hayes-Binet and WISC Verbal suggests that they have considerable in common, yet not so much as the latter two have between them, since the Hayes-Binet and WISC Verbal consist of a mixture of samplings of process and product. The fact that the racial differences on BLAT are smaller than those in the cases of the Hayes-Binet and the WISC Verbal can suggest that racial differences in acculturation are reflected more in the cases of the latter two than in the case of BLAT.

While the results of this research throw no specific light on the matter, the suspicion is strongly held by the author that BLAT can be found by subsequent research to be a more valuable instrument to use on young blind children entering educational programs than either the Hayes-Binet or the WISC Verbal, although it may well lose its descriptive or preductive value later for those same children. The fact that young blind children enter educational programs from such highly divergent, and often disadvantaged, acculturation backgrounds would seem to make paramount the sampling of process rather than of product.

It is well, then, to regard BLAT at this emerging stage as an experimental or preliminary device whose possible values and limitations are yet to be more definitely ascertained.

4. FURTHER RESEARCH POSSIBILITIES

As is true with so much research, the work on BLAT raised more questions than it provided answers. The emergence of a perception of tested "intelligence" in terms of process and product results in the raising of questions on the descriptive or predictive value of these aspects of learning aptitude in regard to all children, not just the blind. This is the focus of some doctoral research now under way, and will not be dealt with here. The questions and curiosities presented below for the most part pertain to BLAT and the blind. The list is by no means exhaustive.

4.1 School Entrance

What are the relative predictive values of BLAT and other tests of learning aptitude when children are tested at the time of entrance into educational programs? As contrasted with testings at later ages? Would combining BLAT results with those of Hayes-Binet or the WISC Verbal provide a better predictive basis at entrance than the use of any of them singly? The finding of no enhanced multiple correlations in these data throws no clear light on this question. What are the relative predictive values of the first-earned scores and the retest scores on BLAT at time of entrance?

4.2 Training

What effect, if any, on performance on BLAT would prior training in tactual discrimination have when two-dimensional and three-dimensional materials are used? To what extent is the use of the training items for each series of items desirable? Psychologically? Statistically?

4.3 Discrimination

There would be merit in working toward a sharper discrimination in scores between age levels. Is greater discrimination possible without the use of the training items? Would greater discrimination be found in the case of retest results as contrasted with first-test results? What extent, if any, would making the test a timed test (specifying time limits on each item) contribute to sharper discrimination? To what extent, if any, would a weighting of the different series of items on the basis of their factor loadings enhance discrimination?

4.4 A Space Factor?

Although the rotation of the stimulus elements was rejected in the development of BLAT, there may be merit in exploring this facet more systematically. Rotation on both the x and y axes would seem to merit specific consideration.

4.5 Nurturance or Regression?

The general increase in retest scores over initial test scores on BLAT aroused curiosity as to whether this trend was due to the psychometric phenomenon of regression or the possible effect of the learning which occurred in the first testing, which would be a plausible psychological phenomenon. Informal analyses of the score changes provided a basis for doubting the adequacy of regression as an explanation. This should be checked more systematically. Could it be that the psychometric phenomenon of regression might be more applicable in terms of product than in terms of process?

4.6 Young Non-White Subjects

The dearth of non-white subjects below the chronological age of 7 was noted. While this probably reflects an important social condition which could have significant educational implications, there is need for more information on younger non-white subjects, particularly as regards BLAT, Hayes-Binet, and WISC Verbal results.

4.7 Saturation Achievement Testing

The fact of a biased sampling of the children who took the Stanford Achievement Test has been indicated. What is badly needed is a testing of all the children, at least from the chronological age of 9 up, using both learning aptitude and achievement tests.

4.8 Educational Expectancy

We just don't know what amounts of learning aptitude in blind children are needed for them to have a reasonable chance for success at different grade or age levels in different academic subjects. To this end the analysis of the results of a saturation testing, perhaps even in a given school that has a large enough number of children, could be very helpful educationally.

4.9 Periodicity in "Mental" Development?

Inspection of the mean scores at successive ages for the three measures of learning aptitude suggests the possibility that there is a periodicity in "growth" reflected by them. This in particularly true with respect to BLAT, there being suggestions of "plateaus" at the 11½-12, 14-14½, and 15½-16 year levels. A parallel periodicity is suggested in the Hayes-Binet mental age data, and somewhat less so in regard to the WISC Verbal test ages (perhaps due in part to the manner in which they were obtained). Psychometrists tend to work for "straight line" data. They may thus be covering up, or washing out, evidence of there being discernible stages in the growth of learning aptitude. The presence of such stages, if identified, would be in harmony with a large body of developmental data that have been on the record since the work by S. A. Courtis in the 1930's.

5. BIBLIOGRAPHY

Abel, G. L. The educational achievement of 5th and 6th grade blind children. (MA thesis abstract) The Teachers Forum. 1938, 10 (5), 109-110.

Allen, R. M., & Katz, E. A method of selecting Stanford-Binet intelligence scale items for evaluating the mental abilities of children severely handicapped by cerebral palsy. Cerebral Palsy Review, 1956, 1, 13-17.

Anastasi, A. Psychology, psychologists, and psychological testing. American Psychologist, 1967, 22 (4), 297-306.

Anderson, R. P. Raven progressive matrices for presentation to the blind. Report of Vocational Rehabilitation Administration, RD-670, 1964.

Bond, N. J., & Dearborn, W. F. The auditory memory and tactual sensibility of the blind. Journal of Educational Psychology. 1917, 8 (1), 21-26.

Buros, O, K. The sixth mental measurements yearbook. Highland Park, New Jersey: The Gryphon Press, 1965, pp. 541-2.

Cattell, R. B. Theory of fluid and crystallized intelligence. Journal of Educational Psychology. 1965, 54 (1), 1-22.

Dauterman, W. L., Shapiro, Bernice, & Suinn, R. M. Performance tests of intelligence for the blind reviewed. The International Journal for the Education of the Blind. Vol. XVII, No. 1, October, 1967, pp. 8-16.

Davis, C. J. The standardization of the Perkins-Binet tests of intelligence. Report of Vocational Rehabilitation Administration, RD-898, (current).

Drummond, W. B. Binet's mental tests and their application to the blind. The Teacher of the Blind. Vol. III, #1, pp. 3-7, January, 1915.

Drummond, W. B. A Binet scale for the blind and a provisional point scale for the blind. Monograph from the Edinburgh Medical Journal, Vol. 24, 1920.

Fortner, E. N. A group intelligence test from braille. The Teachers Forum. 1939, 11 (3), 53-56.

Gilbert, J. & Rubin, E. Evaluating the intellect of blind children. The New Outlook for the Blind. 1965, 5, 9, 7, 238-40.

Guilford, J. P. The nature of human intelligence. New York: McGraw-Hill, 1967.

Haines, T. H. A point scale for the mental measurement of the blind. Journal of Educational Psychology. Vol. VII, No. 3, March, 1916.

Haines, T. H. Mental measurements of the blind. Psychological Monograph, Vol. 21, No. 1 (Whole No. 89), April, 1916.

Haines, T. H. Report of new cases and more reliable age norms of intelligence by the point scale for the blind. Journal of Educational Psychology. 1919, 10 (3), 165-167.

Hayes, S. P. Standard tests in elementary subjects in schools for the blind. Proceedings: 24th Biennial Convention, American Association ot Instructors of the Blind. 1918, 42-54.

Hayes, S. P. Mental and educational survey in seven schools for the blind. Proceedings of the American Association of Instructors for the Blind, 1920.

Hayes, S. P. Self-scoring in schools for the blind. (A manual for the guidance of teachers) Overbrook, Penna.: Pennsylvania Institution for the Instruction of the Blind. No. 2, 1921.

Hayes, S. P. Adaptation of the Binet tests for the blind. Mt. Holyoke College, 1923.

Hayes, S. P. Ten years of psychological research in schools for the blind. Overbrook, Penna.: Pennsylvania Institution for the Instruction of the Blind, No. 4, 1927.

Hayes, S. P. The new revision of the Binet intelligence test for the blind. The Teachers Forum, 1929, 2 (2), 2-4.

Hayes, S. P. Termans condensed guide for the Stanford revision of the Binet-Simon tests. Adapted for use with the blind, Perkins Publication No. 4, 1930.

Hayes, S. P. Factors influencing the school success of the blind. The Teachers Forum. 1934. 6 (5), 91-98.

Hayes, S. P. How to handle test results - a plea for wider use of group tests. The Teachers Forum. 1935, 7 (5), 82-85.

Hayes, S. P. The memory of blind children. (Part I) The Teachers Forum. 1936, 8 (3), 55-59.

Hayes, S. P. The memory of blind children. (Part II) The Teachers Forum. 1936, 8 (3), 71-74.

Hayes, S. P. The measurement of educational achievement in schools for the blind. The Teachers Forum. 1937, 9 (5), 82-90.

Hayes, S. P. What do blind children know? The Teachers Forum. 1938, 11 (2), 22-28.

Hayes, S. P. Practice hints for testers. The Teachers Forum. 1938, 11 (5), 82-93.

Hayes, S. P. Standard graduation exams for elementary schools: Adapted for use in schools for the blind. The Teachers Forum. 1939, 12 (2), 22-31.

Hayes, S. P. Alternative scales for the mental measurement of the visually handicapped. Outlook. Vol. 36, No. 4, October, 1942.

Hayes, S. P. A second test scale for the mental measurement of the visually handicapped. Outlook. Vol. 37, No. 2, February, 1943.

Hayes, S. P. Measuring the intelligence of the blind. In Zahl, F. A. (Ed.), Blindness. Princeton, N. J.: Princeton University Press, 1950.

Hecht, P. J., & Newland, T. E. Learning potential and learning achievement of educationally blind third-eighth graders in a residential school. The International Journal for the Education of the Blind, December, 1965, pp. 1-6.

Hopkins, K. D., & McGuire, L. Mental measurement of the blind, the validity of the Wechsler intelligence scale for children. International Journal for Education of the Blind, 1966, XV, 3, 65-73.

Hopkins, K. D., & McGuire, L. I.Q. constancy and the blind child. International Journal for the Education of the Blind, Vol. XVL, No. 4, May, 1967.

Horn, J. L., & Cattell, R. B. Age differences in fluid and crystallized intelligence. Acta Psychologica, 1967, 26, 107-129.

Irwin, R. B., & Goddard, H. H. Adaptation of the Binet-Simon tests. Vineland, N. J.: 1914.

Irwin, R. B. A Binet scale for the blind. Outlook for the Blind, Vol. VIII, No. 3, Autumn, 1914.

Knotts, J. R., & Miles, W. R. The maze-learning ability of blind compared with sighted children. Journal of Genetic Psychology. 1929, 36 (1), 21-50.

Kohs, S. C. The Ohwaki-Kohs block design test. The Proceedings of West Coast Regional Conference on Research Related to Blind Severely Visually Impaired Children. New York: American Foundation for the Blind, 1965.

McNemar, Q. The revision of the Stanford-Binet scale. Boston: Houghton-Mifflin, 1942.

Merry, F. A survey of the problem-solving ability of pupils in six residential schools for the blind. The Teachers Forum, 1931, 3 (5), 12-15.

Merry, R. V. To what extent can blind children recognize tactually, simple embossed pictures? The Teachers Forum, 1930, 3 (1), 2-5.

Merry, R. V., & Merry, F. K. The finger maze as a supplementary test of intelligence for blind children. Journal of Genetic Psychology, 1934, 44, 227-230.

Newland, T. E. The blind learning aptitude test. In Report of Proceedings of Research Needs in Braille, New York: American Foundation for the Blind, Inc., 1961, pp. 40-51.

Newland, T. E. Predictions and evaluation of academic learning by blind children: I - Problems and procedures in prediction. International Journal for the Education of the Blind, 1964, 14, 1-7.

Newland, T. E. Predictions and evaluation of academic learning by blind children: II - Problems and procedures in evaluation. International Journal for the Education of the Blind, 1964, 14, 42-51.

Pearson, M. A. Establishment of school and college ability test norms for blind children in grades 4, 5, and 6. (Doctoral dissertation, University of Oklahoma) 1962.

Pintner, Rudolph, & Paterson, D. G. A scale of performance tests. New York: D. Appleton & Co., 1925, 218 p.

Rankin, R. J. The Ohwaki-Kohs tactile block design intelligence test. (Rev.) Journal of Educational Measurement Vol. 4, No. 4, Winter, 1967, pp. 261-2.

Rich, C. C. The validity of an adaptation of Raven's progressive matrices test for use with blind children. (Doctoral dissertation, Texas Technological College), 1963.

Rich, C. C., & Anderson, R. P. A tactual form of the progressive matrices for use with blind children. Personnel and Guidance Journal, 1965, 43 (9), 912-919. (Reprinted in American Foundation for the Blind Research Bulletin, No. 15, January, 1968, pp. 49-60.)

Sargent, R. T. The Otis classification test, form A, part II. (Adapted for use with the blind) The Teachers Forum, 1931, 4 (2), 30-33.

Tillman, M. H. The performance of blind and sighted children on the Wechsler intelligence scale for children: Study I. International Journal for the Education of the Blind, Vol. XVI, No. 3, March, 1967.

Tillman, M. H. The performance of blind and sighted children on the Wechsler intelligence scale for children: Study II. International Journal for the Education of the Blind, Vol. XVI, No. 4, May, 1967.

Wattron, V. B. A suggested performance test of intelligence. New Outlook, Vol. 50, #4, April, 1956.

Wechsler, D. The measurement of intelligence. Baltimore: Williams & Wilkins, 1939, page 138.

Williams, M. Williams intelligence test for children with defective Vision. University of Birmingham, England, 1956.

6. APPENDIX A

Presented is the tabulation below from which the training and test items were obtained. Some were used as they appeared in the tests indicated; others were modified.

Parent Test	Training Items		Test Items	
	As Was	Modified	As Was	Modified
American Council on Education	T7			27, 32
Cattell Culture Free	T1, T11		2, 6, 46	17, 43
Kuhlmann-Anderson (Form 6)	T3		7, 10, 11, 12, 15	14
Kuhlmann-Finch				19, 20, 28, 29, 30, 31, 33, 34, 35
Progressive Matrices (1938)	T9, T10	T12	38, 44, 45, 47, 48, 49	22, 23, 24, 25, 26, 39, 40, 41, 42
Primary Mental Abilities			13	
Pattern Perception Test (1943)	T2		1, 3, 5, 8	
Sleight Non-Verbal	T4		9	
Original	T5, T6, T8		4, 16, 18, 21, 36, 37	

APPENDIX B

Background Information Form

Case No. ________

____
SCHOOL

__________________ M__F__ Birth ___|___|___ ___|___|___
Last name first middle Race Mo. Day Yr. Mo. Day Year of info.

Eye Condition: Degree of vision, RE ___ LE ___ Date of onset: _______
Diagnosis & etiology: ______________________
Attending discomfort & medications: ______________________
Prognosis: ______________________
Blindisms & effects of blindness: ______________________
Other handicaps: ______________________
Medical & physical health data: Ht.___Wt.___ ______ Hear'g. Test ___RE | ___LE
Epilepsy: Yes__No__ Last Exam. Date-None made
Depressive medication? Yes__No__ Kind_____ Comments__________

Test Data: Name & Form of Test	Date Given	MA	IQ	Other Data	C.A.
Intel.					

Education (Most Recent) Grade Total EGS EGS EGS EGS

____

Voc. and others: ______________________
____

Comments on Testing: ______________________
____

Educational History: Entered this school ___Mo.|___Yr. Gr.Placem't. _______
No. Years (Then)

Previous sch. attended: (Sighted) ______________________
Present Grade (Blind) ______________________
(None) ______________________

Qual. of Performance: Gr.Pt.Avg.___or%____or____.
Superior___Above Avg.___Avg.___Below Avg.___Poor___Over(No.Yrs.)___
Performance Consistent? ____________ Or spotty? ____________
Comments: ______________________

Family Data: Parents live together__; Home broken: Death, F__M______
Separation ____________
Divorce:__With whom child lives? Parents__Grandparents__________
Step-parents____ Other __________
Blindness in parents: F___M___Neither__Occupation of Responsible
Parents: F________M____________

Education level of home:	F	M
No higher than 8th		
No higher than 12th		
Higher than 12th		

Comments: ______________________
____
____

Siblings: If none, check here ____________.

Under 1 yr.	1 yr.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	over 16
Sex																	
Educ.Level																	
Public or Sch. for Blind																	

BI-1-2-1653

APPENDIX C

BLAT Factor Analysis - Rotated Factors

Item	Communality	1	2	3	4
1	.0947	-.0286	.2885	.0052	.1027
2	.1229	-.1376	.3121	.0304	.0751
3	.3754	-.2084	.5250	-.1488	.1849
4	.0580	-.0858	.0614	.0063	.2164
5	.2708	-.1435	.4338	-.1605	.1905
6	.2434	-.1202	.3772	-.0748	.2846
7	.2821	-.2354	.2093	-.4196	.0825
8	.4123	-.3425	.4812	-.1572	.1971
9	.4341	-.1232	.5560	-.3183	.0918
10	.4071	-.2399	.4737	-.3492	.0561
11	.5238	-.1904	.5320	-.4428	.0922
12	.3969	-.1415	.5628	-.2314	.0813
13	.3116	-.2807	.3738	-.2649	.1516
14	.4972	-.1436	.6285	-.2412	.1528
15	.3319	-.2061	.4270	-.3257	.0319
16	.2516	-.1529	.0896	-.3631	.2972
17	.2266	-.2700	.1115	-.3002	.2262
18	.1930	-.1271	.2574	-.1380	.3026
19	.4719	-.3384	.1617	-.5748	.0280
20	.0681	-.0739	.1170	-.2208	.0133
21	.4035	-.3318	.0997	-.5153	.1337
22	.4925	-.0967	.4103	-.3492	.4391
23	.5002	-.4910	.3647	-.2562	.2459
24	.4111	-.1516	.2975	-.3190	.4448
25	.4726	-.4704	.3059	-.2713	.2901
26	.3091	-.5035	.1600	-.0846	.1510
27	.2545	-.3561	.2263	-.1420	.2373
28	.4250	-.5713	.1702	-.1982	.1743
29	.4980	-.5710	.1604	-.3429	.1691
30	.4400	-.6187	.1305	-.1863	.0741
31	.5582	-.6297	.1429	-.3156	.2040
32	.4702	-.6637	.1203	-.0895	.0852
33	.5911	-.6536	.1869	-.3482	.0883
34	.7083	-.7234	.2559	-.3172	.1375
35	.3076	-.4407	.0591	-.3188	.0908
36	.3635	-.5481	.1789	-.1643	.0645
37	.2191	-.3945	.1527	-.2004	.0040
38	.4583	-.2545	.3175	-.5405	.0235
39	.5127	-.1235	.4989	-.3719	.3320
40	.3801	-.1841	.3434	-.4151	.2366
41	.5387	-.3279	.3803	-.4514	.2877
42	.3891	-.2059	.3039	-.3930	.3160
43	.6605	-.2123	.5918	-.2102	.4702
44	.6539	-.1399	.5490	-.2503	.5199
45	.5054	-.2449	.4205	-.3635	.3694
46	.3319	-.2796	.3237	-.3466	.1695
47	.4032	-.3384	.1333	-.4815	.1976
48	.3282	-.2373	.1411	-.4638	.1919
49	.3331	-.3220	.0928	-.4612	.0901
Sum Sq.	18.8929	5.9807	5.5629	4.9083	2.4410
Per Cent N	38.56	12.21	11.35	10.02	4.98

APPENDIX D.
MANUAL OF DIRECTIONS

Blind Learning Aptitude Test

The test items consist of lines and geometric figures presented in bas relief form. While it is true that the perception of the problem and the identification of the element which solves it involve the making of tactual discriminations, none necessitates the fine discrimination which is necessary for the reading of braille. The braille cell is 1/4" wide and 3/8" high, and is made up of dots (pips) which are 3/32" apart, on center. No such fine tactual discrimination is called for in the solution of the test items in the BLAT. Nor is any reading of braille called for. While those who have had training in the reading of braille undoubtedly can perceive the elements within the test items with relative ease, children who have had no significant amount of braille training can perceive the elements sufficiently easily to deal with the problems presented. How children who have had no tactual discrimination training might perform on the BLAT is not known.

Performance on the items requires no verbalized response by the subject (S). The words used in administering the test should be extremely simple; for younger children, they must be. Except in the case of a very few items, the cultural backgrounds of the Ss are believed to be likely to have little effect on their performance on these materials; some items which appear to necessitate the use of number skills can be solved in terms of mass. Ss can and do react correctly to shapes as shapes without having acquired the verbal equivalents of "right angles", "circles", "squares", the letter "L", "T", or "V", etc.

As in any testing situation, the establishment of optimal rapport contributes definitely to the validity of the data being collected. The experienced examiner (E) will have his own methods of establishing rapport. Since the items are novel and have been found to have intrinsic interest value for most children, E need feel no apprehension about an S's willingness to cooperate. A comfortable, matter-of-fact attitude on the part of E is most likely to assure S that the test situation will not be a threatening one. E's complete familiarity with the administration procedure prior to using materials with a blind child will contribute much to S's feeling at ease.

The following terms are used specific to these materials. The word "field" is used here to denote all the space on the page occupied by both the stimulus elements and the response elements which constitute the test items. The "stimulus element" may be a single figure, pattern, or group of figures which the subject is asked initially to perceive in the process of comprehending the problem. The "response elements" compose the group from which S chooses in order to indicate his solution of the problem. The terms "field" and "test item" at times may be used roughly synonymously.

There are marked differences in the ways in which the blind explore their "visual fields". E should seek to discover as early as possible the way in which S "sees" and adapt the training and testing procedures accordingly. Older Ss, for instance, may explore their "visual" fields with one or more fingers of one or both hands. Young children may need special help or reminding in order to make sure that they explore the whole field. Particularly for them, the relationship between the size of their finger (or fingers) and the size of the different stimulus elements is a matter to be given constant consideration. E should make every effort to be certain that S perceives, first, the whole field, which incorporates the test element or elements, and then each of the possible response elements.

It is best to have S seated directly across the table from E. This permits free manipulation of the materials and provides a clear and unobstructed view of S's defining his problem, his process of arriving at a solution, and the identification of his responses. The book of test items should be placed before S so that, after the first series, the stimulus element is to S's left (your right).

In your initial approach to S, say, "I have some things that I want you to look at. Other boys and girls have found them very interesting. I am sure you will too. I want to see how well you can do on them. Some are very easy; others may be harder, but I shall help you with some at first."

Very definitely at first, and decreasingly as S becomes familiar with the procedure, E should guide S's fingers over the field. Those familiar with work with the blind will recognize both the importance of the blind S's correctly identifying the field within which he is to work and the differences among blind S's in the ways in which they can be helped to explore that field. At the beginning of the testing, S's fingers should be guided, rather slowly, over the whole field. After doing that, S's fingers then should be guided, a bit more slowly, over the outlines of each stimulus and response element. As the testing progresses, the involvement of E thus in helping S to see the field and the elements in it will decrease - particularly within each series of items. As a general rule, it is well to allow S to explore the elements as much as he wishes.

With young S's, for instance, it may be necessary to help them explore the field and the elements of the test by guiding their fingers (usually the index finger, or the first two fingers of the preferred hand). In most instances, the child's exploration can be helped by holding lightly the preferred hand, from the top, and moving the hand in such a manner that the "reading" finger or fingers are guided over the outlines of the elements. Many older blind Ss do not like to have their hands guided, preferring to get their cues from guidance supplied at the wrist. After the initial space orientation, most Ss very quickly "take over", some "setting" their field with both hands and proceeding with the test with one or both hands, as their reading habits may be.

Care should be taken to provide only as much help in getting oriented as S actually needs, giving him every opportunity to do his own exploring, yet making sure, particularly in the training stages, that S overlooks no part of the items. Obviously, after S has started on the test items, such help is not justified. Once in awhile, a reminder may be in order such as, "Be sure to look at all of them." In such instances, be sure not to make such a comment only when S fails an item due to his not having examined the whole field.

E should adapt the direction for the later parts of the test in terms of S's demonstrated ability to "set" his field and to identify and examine the stimulus and response elements. With more capable and usually older Ss, orientation at the beginning of a line of elements or over a pattern of elements may suffice.

No time limits are specified for the items. For the most part Ss will arrive at item solutions in less than a minute. Generally, some solution (correct or incorrect) will be forthcoming in not more than two minutes. E will have to use his judgment in deciding how much to allow S on items. It is doubtful if anything will be gained by allowing more than three minutes on even a more difficult item. Occasionally, S may indicate rather clearly by the way(s) he is looking at an item that he has pretty well arrived at a solution. In such instances, nonthreateningly asking him the question, "Which one is correct?" will evoke a clear response. In a very few instances, S may seem to have departed psychologically from the testing situation. Here, such a query may serve the purpose of bringing him back to the task at hand.

In the cases of a very few children, the total testing time may be such that they are likely to become tired even though their interest may appear to be continuing satisfactorily. E will do well to watch for the need for a break in the work and will, if he deems it necessary, allow for a brief rest period between two series of items. Experience suggests that this more often occurs after item 21, although, with the majority of children no break is necessary.

In the process of administering the items, E is asked to keep a record of three things in the spaces provided on the response sheet:

1) Observations concerning the handedness of S, the quality or manner of his response, fatiguability, frustration, and the like, are to be recorded under "Examination behavior" near the top of the response sheet.

Be sure to check as well as you can to see if there is any evidence of lowered kinesthetic sensitivity. Absence of any observations here regarding this problem will be taken to mean that E had no reason to assume the presence of any such condition in S. Early in the school year, some children's fingers lose some sensitivity due to play or work activity. If a diabetic condition is known or reported to be present in the child, so indicate and make clear your impression as to whether or not it may have affected S's responses.

2) In the "Correct" column, put a check mark if the correct response is given by S; in the "Error Made" column, record the number of the element indicated by S as his solution.

When a child, entirely on his own initiative, decides to change his answer to any item which he had firmly given as his response, record his new response, striking out the old response with a slant (/). Do this regardless of whether he changes from an incorrect to a correct response or vice versa. Be sure to try to differentiate between the possibility that such behavior is a seriously arrived at decision and the possibility that he may be trying to get some clue from you that such a change may have merit. A quiet "You would rather have me take this answer than the other one you gave me?" usually suffices to place the responsibility for such a change solely on him.

The manner of numbering the response elements in the items varies among the different kinds of items. For items 1 through 8, for instance, stimulus elements are numbered 1, 2, 3, etc., from left to right, each one being a potential response element. In the cases of items 9 through 21, the stimulus element or the pattern of stimulus elements is separated from the response elements and only the response elements are numbered 1, 2, 3, etc., from left to right. The response elements in items 22 through 27 are numbered from S's left to right by rows. For example: 1 2
3 4

For items 28 through 49, the response elements are numbered from S's left to right by rows. For example: 1 2
3 4
5 6

3) In the "Comments" column, record observations of S's behavior which will throw light on the nature and/or quality of his problem solving.

The items are grouped into what appear to be common types, and the types are arranged in what appears now to be a rough order of increasing difficulty. Within each type, there is an increase in difficulty. For this reason, wherever possible, S is to be confronted with not less than five items, subsequent to the one on which he last succeeded. In other words, where the length of a series permits, a series of five successive errors should terminate the testing in that series. Then go on to the training items in the next following group of items.

The items are to be presented in the order indicated by the number sequence at the extreme left of each line on the response sheet. The items themselves are numbered in the top right corner and are so arranged in the test book.

The first two items of each series are to be used as training items. Assist S, if necessary, to find the correct response element and to discover and state if he can, the correct reason for the choice of the correct response element. Some children (as well as some adults) can "solve" these without being able to tell why. Such Ss are to be helped in verbalizing their behavior. E should make every reasonable effort to enable S to be trained to mastery on each training item. In helping Ss to tell how they came to make the decision they did, watch your vocabulary. It's better to say: "Each gets bigger than the one before it," or "They get bigger as you go across, don't they?" than it is to say: "You mean that the figures became proportionately larger as you progress from left to right." It is better to say (with a T figure), "Yes, this goes across this way (guiding S's finger), and this goes down." than to say: "It looks like a T, doesn't it?" In some instances, you will need to be satisfied with "It's just like this one " (as S points to the correct response element). Remember that this is not a test of verbal facility. Take particular care, in the process of ascertaining how S solved any training item, that your choice of words, tone of voice, or inflection in no way threatens S.

It may be helpful, in evaluating the child's performance, if, especially with respect to the training items in each group, you record in the "Comments" column characterizations of his behavior. These would be reflected in such notations as: "Trained O.K.," meaning he learned quickly. "Trained slowly," meaning he required a bit of help to get the correct idea. "Trained with difficulty," meaning he needed much help before he succeeded, even to the point of having to be told the answer and the reason for it. "Did not comprehend," meaning that, in spite of all help and a variety of explanations, he still failed to understand the process involved. "Verbalized easily (clearly) or quickly" should mean that, on his own, S put his correct solution(s) into understandable statements. "Unable to verbalize" would mean that S responded correctly to items but couldn't tell why or how he arrived at the decision. If E helps S to verbalize a correct solution, E should ask S to "Tell me in your own words why that is the correct answer."

After the second training item in each series is completed, introduce S to the test items with the statement: "The rest in this group are like the ones you have just finished, but you are to do them by yourself (on your own). Do them in the same way you (we) have just done them."

By the time S has completed the training items, the chances are fairly high that he has learned to expect a fairly well-defined working field to be in front of him. When he starts working on the items, be sure to help him first to discover, especially at the beginning of a test series, the size of the field in which the elements appear, as well as to get some idea, for the different series, as to how the elements are placed on it.

It is important that E make sure that each time S is confronted with an item he is aware of what is to be done. With younger and less capable Ss, it may be necessary for E to repeat the task question ("Which one doesn't belong?" or "is different"; "Find the one over here that is just like this one."; "Which one of these comes next up here?", etc.) each time E presents S a new item. With older and more capable Ss, E can discover when it is not necessary to repeat the task question and adapt his procedure accordingly.

Ss often take the initiative in turning the item pages, thus making easier the recording by E. Such a practice is appropriate as long as it does not interfere with E's record keeping. When this occurs before you are ready to start on the training items of a new series, quietly say to S, "Now, those are a bit different; I'll need to tell you about them." With varying degrees of adaptability, Ss will come more and more to "take over" - quickly locating the item, going to the stimulus and response elements (often before the formal directions may be concluded), and even turning to the next page after he has completed an item. This is quite acceptable so long as E has time enough to record S's responses and S doesn't skip an item in so doing.

Generally, it is helpful, on the first few test items of a series, to aid S in locating the items, in following through on the items as the directions are given, and in getting his final orientation on the stimulus and response elements before expecting him to proceed on his own toward his solution.

Test Items 1 through 8. All of the elements in each of these items serve initially as stimulus elements, but one of them becomes a response element. This is the only series where this condition maintains.

First Training Item. Say to S, while guiding his hand(s) to identify the field, "Look at all of these. (For general orientation, slowly guide his hand across the item elements as a group. Then help him, as you go across left to right, to look at the outline of each element.) Now, look at all of these (elements) again and find the one that is not like the others. Which one is different?" If S indicates the correct one, say, "That is correct. Now can you tell me why that one is not like the others? Why is it different?" Remember to keep this inquiry as unthreatening as possible. If a correct reason is given, proceed to the second training item.

If S does not verbalize clearly or adequately, help him put his correct solution into words in some such manner as, "Yes, that is correct. The one you picked is different from the others, isn't it? It has lines in it, and the others don't" or "is shaped like this (tracing the shape of the correct element) and all the others are shaped like this." (Trace the shapes of the incorrect ones.) Occasionally, a child will point to the correct response, after he has shown by his examination of the possibilities that he is thinking correctly or effectively, but be unable or unwilling to put in words his thinking process or his reason for picking the correct element. In such (rare) cases, say for him, "Yes, that one has something in it and the others don't." and so on to the next training (or test) item. Always be careful of your own vocabulary, particularly with young Ss. Avoid initiating the use of such terms as "crosshatched", "square", "triangle", "oval", etc.

If S does not choose the correct element, help him again to examine each of the elements, saying to him as he goes along, "Now this one (the first) is just like this one (the second). Look at these (the third and fourth). They are just like these (guiding his hand back to the earlier elements). Now let's look at this one (the fifth). Is it just like the others, or like this one? (the sixth, going on to the end of the line.) No, it is different (verbalize the difference: "It has something in it."). So the one that is not just like the others is this one. This one is different. Do you see now how this one is done?" Pause for a moment and then, on the same training item, have him pick out the one that is different, saying, "Now you look at all of them and show me which one is different - which one doesn't belong."

As in this illustration, S is to be helped, if necessary, not only to find the correct solution but also if possible to say in his own words or in words he can understand why the designated element is regarded as correct. Be sure to be careful of your own vocabulary, particularly with young Ss. Only if S introduces such terms as "triangle", "square", "oval", "pentagon", "crosshatched", etc. into his own reasons should they be used. Remember that the fact that a child may use the word "square" does not necessarily mean that he will recognize and know a diamond, rectangle, etc. It is to be remembered that these items are training items, and S should demonstrate complete mastery of each item (giving his reasons in his own words, if possible) before going on to the succeeding item.

Verbalize for S if necessary, but accept the element(s) he identifies clearly through motor solution or by any other unambiguous indication if he gives evidence of being unable to verbalize his behavior. Just like all of us, the blind can and do solve problems like these, not guessing blindly but by a reasoning process, even though appropriate verbalization can not or may not be given for that process.

Second Training Item. Say to S, "Do the same thing with this one. Look at all these (elements) and find the one that is not like the others. Which one is different?" S should be helped to trace the outline of each element. With some Ss the need for meticulous tracing of the elements decreases rather quickly.

If S picks the correct response element, ask him to tell you why or how that one is different. If his reasons have a logical basis, proceed with the test items. As in the case of the preceding training item, if he picks the correct response element, but does not give an adequate reason, help him verbalize his behavior as with the first training item above. If he does not pick the correct one, help him to locate the correct element and to discover the reason for its correctness. As before, present him the item again and see if he has the idea.

After the training items in each series are completed, introduce S to the other items in the series with the statement: "The rest in this group are like the ones you have just completed. Do them in the same way you (we) have done them here." Occasionally, a youngster may expect help on the test items. If this occurs, tell him that he is to do "this group just the way we did the practice ones."

Test Items 9 through 15. Remember, in each training item, to check the reasons for S's choice of response and, if necessary, to train for mastery of the item.

First Training Item. Say, "The next one is a little bit different. Let's look at it. Now, look at all of these. (Guide S's hand to assist him in establishing his full visual field.) Now look at this one over here. (Guide S's hand to the stimulus element - the one at your right.) I want you to find one just like it among these over here. (Guide S's hand carefully over each of the response elements.) Be sure to look at all of them (response elements) and find one just like (or "exactly like") this one" (helping S look again at the stimulus element).

If S has difficulty with this training item, help him do it, saying, "Now look at this (the stimulus element). See, this goes down like this (guiding S's finger down the vertical line). See, then it goes across like this (guiding S's finger across on the line moving to your left.) See it goes down and then over" (tracing the lines again). Remember that a blind child may not know what an "L" looks like. This is especially true of young blind children, unless they have lost their sight after knowing what printed letters look like. If an older, more sophisticated child initiates a comment to the effect that it is, or looks like, an "L", capitalize on the observation and proceed accordingly. Proceed with the response elements essentially as follows: "Now in this one (the first response element), it goes down like this (tracing one of the crossing lines in the "X") and then it goes down here (tracing the other crossing line in the "X"), like this." Help S compare this response element with the stimulus element, directing his examination of the elements while saying, "This one (the first response element) looks like this, but this one (the stimulus element) looks like this. But they don't look alike. Now let's look at the next one and see if it is like the first one we looked at. In this one (the next response element), it goes down like this and across like this." Compare this response element with the stimulus element, helping S see that they are not alike. Proceed similarly with each of the other response elements, helping S compare each with the stimulus element. Come back to the correct response element and help S see that (and how) they are alike.

Again, be careful of the words you use. Don't say, "This goes from the left to the right," or "This is vertical," or "This is on an angle", or even "This is backwards", unless the child initiates the use of such words correctly.

As with the training items in the preceding series, re-present the item, if necessary, in order to make sure that S gets the idea. Seek S's verbalization only as far as feasible and necessary.

Second Training Item. Say, "Now, do the same thing with this one. Look at this one (tracing the stimulus element). I want you to find the one just (exactly) like it over here" (orienting him so that S sees each response element). Proceed in detail as above, if necessary.

As S progresses through the several series his verbalization on the training items can be expected to decrease. As early as in the second series, E will be able to see just how S goes about solving the items. In fact, S's hand movements often show much more clearly the manner of his thinking than will S's verbalization of what he did, or is doing. Keep in mind the fact that verbalization is sought, or supplied by E, primarily for the purpose of aiding S in giving evidence that he understands the problem involved and is using the proper approach in its solution. Verbalization on any training item is helpful, but as E comes increasingly to understand S's manner of "setting" the problem and solving it, the need to have S verbalize his behavior will decrease. There is the further matter, too, that as S progresses into some of the more complex relationships in subsequent series, the task of verbalizing becomes increasingly burdensome, if not very difficult. As has been pointed out, S need not verbalize in order to perform adequately on this test. If, however, S continues to verbalize his manner of solution of the test items, or the characteristics of his solutions, he need not be discouraged when he is correct nor corrected if he is in error.

Test Items 16 through 21. In checking for the S's reasons, on each of these training items, endeavor to make sure he gets the idea that there is a progression. Train, if necessary, for mastery, being careful about what words you use.

First Training Item. Say, "This is another kind. Look at this one (first stimulus element at your right), this one (second stimulus element), and then at this one" (third stimulus element). Be sure to guide S's finger(s) over each stimulus and response element as meticulously as necessary in order to assure his seeing them as separates. "Now, let's look carefully at these (stimulus elements) again. See, this one (guiding S's finger around the first stimulus element) is real small, the next one is the same shape but is a little larger, and this one is the same shape and is still larger. Now look at all of these down here (the individual response elements) and find the one that should come next with these up here" (returning S's finger to the stimulus elements and moving it from your right to your left moderately slowly across each of them).

Second Training Item. In like manner say, "Do the same kind of thing here. Look at this one (stimulus element one), and at this one (stimulus element two), and then at this one (stimulus element three). Now you are to look at all of these down here (the individual response elements) and find the one that should come next. Which one down here should come next with these up here? Now let's look again at these up here." Guiding S's finger appropriately, say, "The first one has these lines that cross and one line on the side. The next one has the lines that cross, and has two sides. This last one has the lines that cross, and it has three lines on the sides. Now look down here (response elements) and find the one that should come next with these up here." If necessary, repeat, stressing the "one", "two", and "three".

Is a rest break needed here? (Not more than 10 per cent of Ss need one.)

Test Items 22 through 37. The general task of E here is to help S to get the idea that there is a pattern (or matrix) to be completed, and/or that there is an a:b::c:d relationship to be satisfied - without using such terms, however. The following approach has been found most likely to convey the essential idea. Take care to help S to see that the stimulus elements constitute one group and that the response elements make up another group.

First Training Item. Say, "Now, this one is a little bit different." Guide S's hand so as to show him both the general location of the stimulus and response elements on the page and the individual elements in the groups. "Notice that (or "See,) we have these things (the individual stimulus elements) together here. And we have these (the individual response elements) over here in a group. Now, this one (the stimulus element to S's extreme left - the circle) goes with this one (the elipse or long circle) in some way. These two belong together. (Help S look at both elements, moving his finger(s) over both of them two or three times in a way to convey the idea that they are associated.) Now, one of these over here (guiding S's hand over all the response elements, one at a time) should go with this one (guiding S's hand over the square element in the stimulus pattern) in some way, too. Now, remember that these two (helping S to look again at the top two) belong together in some way, and we want to find which one of these over here (response elements) belongs (goes) with this one over here (stimulus element) in the same way that these two (the top pair of stimulus elements) belong together."

It is often difficult to convey ideas of this kind of relationship to young blind children, but the kind of behavior sampled is an important one. Various approaches to helping the S to state his reasons should be tried, making certain that none of them exceed his experience. Take care to use most judiciously words such as "circle", "oval", "square", and "rectangle". Often it is better to say, "This one (the circle) is round and small. This one (the oval) is round but spread out (or long this way). Now this one (the square) is small, and we need to find which of these (guiding S to the individual response elements) goes with it the same way these two (upper stimulus pair) went together." Let S explore the response elements to see if he has the idea. If he appears not to get the idea, go back to the circle and oval, then to the small square and say, "Something long should go with this (the square). Let's look over here (guiding S's hand(s)). This one is long but it is standing up, so we don't want it because this one (the oval) is lying down. This one (the horizontal rectangle) though is lying down, so it should go with this one (the small square). These two belong together the same way these (circle, oval) belong together." If S has the concept of square corners, that idea can be used in helping him set the problem and arrive at the solution.

From this point on in the test, it may be more hampering than helpful for E to press S for the verbalization of his solutions. However, it is not to be repressed. The manner in which S moves his fingers among the elements is likely to suggest surprisingly clearly to E the way in which S is understanding the task and arriving at a solution.

Second Training Item. Say, "Now, let's look at this." (Guide S's hand to show location of the stimulus and response elements on the page.) "Look at these (the stimulus elements constituting the stimulus pattern). This one (the circle with nothing in it) goes (belongs) with this one (guiding S's fingers(s) in such a way as to convey the idea that the two circles constitute a single stimulus element) in some way (adjacent circles that have nothing in them). Now, one of these over here (helping S identify the response elements individually) should go (belong) with this one (the circle with lines in it) in some way, too. Now, remember, these (the circle and the adjacent circles) go (belong) together in some way, and we want to know which of these over here (response elements) goes (belongs) with this one (lined circle) in the same way." If necessary, help S here, as in the case of the first training item for this group, to make sure that S understands the problem.

Test Items 38 through 42. Insofar as it is deemed helpful, check S's reason for each of his training item responses. If necessary, train for mastery of both training items.

First Training Item. Especially in the case of younger Ss, keep in mind the possibility that this stimulus element may not be perceived as an incomplete circle. Say, "Look at this one. (Guide S's hand over the large circle - stimulus element - to where the gap is.) See, here is a place where part of it is missing. (Guide his finger(s) over the gap in a curving manner, such as to complete the circle.) Over here (response elements) are some parts. Look at each one of these (guiding S's finger(s) over each response element) and find the part that belongs over here in this space (guiding S back to the curved gap in the stimulus element and then over the rest of the stimulus element).

Remember, with younger Ss it may be better to say, "Yes, this one goes around like this (guiding) but part of it isn't here," rather than, "Yes, this circle needs to be completed."

Second Training Item. Say, "Look at this big one (guiding S's hand over the complete stimulus element). Here (part of the stimulus element) is a place where something is missing (guiding S over a *right-angled* completion). Look over here (response elements) and find the one that should go over here." (Guide S's finger(s) to the right-angled space.) Be sure to make 90-degree turns at the corners.

In each successive item in this series, show S the location of the empty space in the large pattern, or matrix. In administering this test series it is important to help S get the idea that there is a *total pattern* in each stimulus field without causing him to look at each dot in the field. The idea of horizontalness or verticalness and diagonalness can be communicated in an unverbalized manner by guiding S's hand (fingers) at moderate speed along several of the lines. On Item 40, small children especially will need to be helped to see the relationships between the columns and rows (squares, to sighted persons).

Test Items 43 through 49. As suggested before, check as appropriate for understanding and train, if necessary, for mastery of the training items. Even though, in some of the earlier items in this series, the correct response element may be identified on the basis of its similarity to the stimulus element horizontally adjacent to the open space in the matrix, E should seek to communicate to S the idea that a *pattern* of stimulus elements exists and that the pattern is to be completed. To this end, it is helpful to help S look at the stimulus elements as in rows, with one missing in the bottom (to him) row and as in columns, with one missing in the last (to him) column.

First Training Item. Say, "This is quite a bit like some which we have had." Guide S's hand first over *each* stimulus element in such a way as to help S see that the elements constitute a pattern, or matrix, starting from S's left in each row and from the top of each column, starting with the column at S's left. After having thus sought to help S get the sense of pattern (as well as the size of the stimulus field), go over the elements again individually and more slowly, saying, "Now, look at *this* one, then *this* one, then *this* one. Down here (second row), look at this one ... ", etc. Proceed deliberately in like manner with the columns. (With younger Ss, age 8 or less, for instance, it may be better to stress the row orientation more than the column orientation.) When you come to the space in the matrix with no element in it, say, "Something should be here, with the rest of these (guiding S's hand back over the matrix). Over here (guiding S to the response elements, first for total orientation to them as a field and then quite deliberately over *each* response element) one of these should go back here (guiding S's hand to the space in the matrix) with the rest of these (whole stimulus field orientation)." Take him again through the matrix orientation and when he comes to the space, guide him to the response field and say, "You show me which of these should go there" (guiding him back to the space in the matrix). Proceed in like manner with the second training item.

The score is the total number of correct responses to the test items (not including the training items).

APPENDIX E

BLAT RESPONSE SHEET
968220

Case No. ____________
Age ____________
Vix. Ac. ____________

____
SCHOOL

Sex-Race ____________

____
NAME(Last) First Middle

Date Tested____________
Mo. Day Yr.

Tested By: ____________________

Examination behavior: Time of day test given ____________. Alert, apathetic, overactive, sluggish, cooperative, uncooperative, inquisitive, sure, uncertain, definite, indefinite, independent, dependent, restless, at ease. ____

Item No.	Ans.	Response Correct	 Error Made	Comments
	5	Tr		
	6	Tr		
1	2			
2	3			
3	4			
4	6			
5	1			
6	6			
7	5			
8	3			
	4	Tr		
	3	Tr		
9	3			
10	2			
11	3			
12	1			
13	4			
14	2			
15	4			
	4	Tr		
	2	Tr		
16	3			
17	3			
18	1			
19	6			

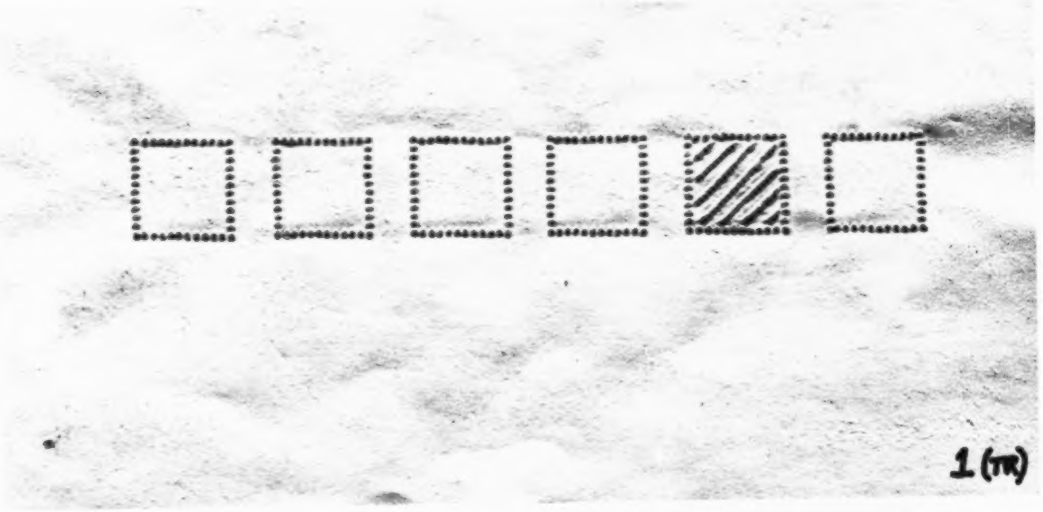
APPENDIX E
BLAT RESPONSE SHEET
968220

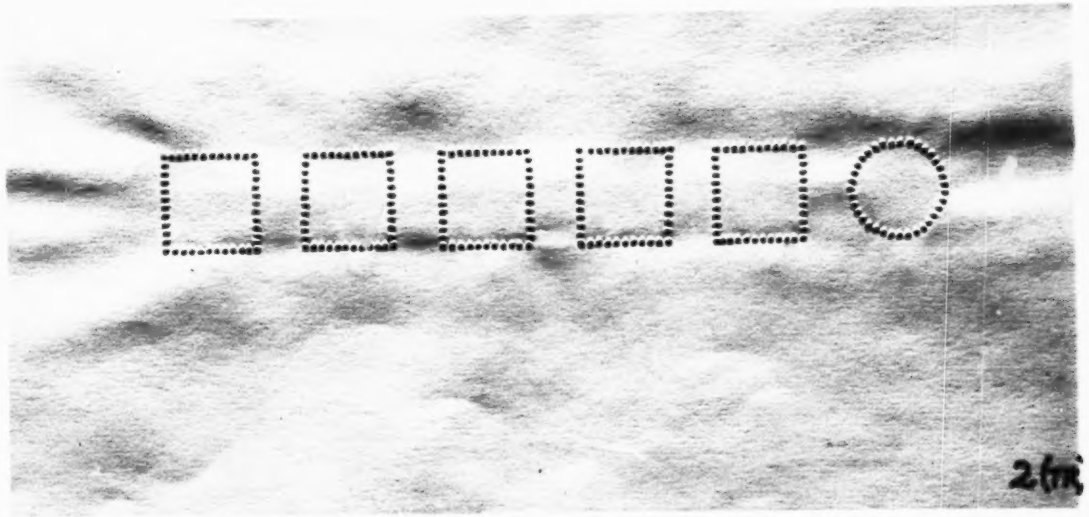
		Response		
Item No.	Ans.	Correct	Error Made	Comments
20	5			
21	4			
	4	Tr		
	6	Tr		
22	2			
23	2			
24	3			
25	4			
26	4			
27	1			
28	6			
29	2			
30	4			
31	5			
32	3			
33	6			
34	1			
35	1			
36	2			
37	4			
	3	Tr		
	5	Tr		
38	4			
39	3			
40	6			
41	1			
42	2			
	4	Tr		
	2	Tr		
43	1			
44	4			
45	3			
46	4			
47	5			
48	5			
49	3			

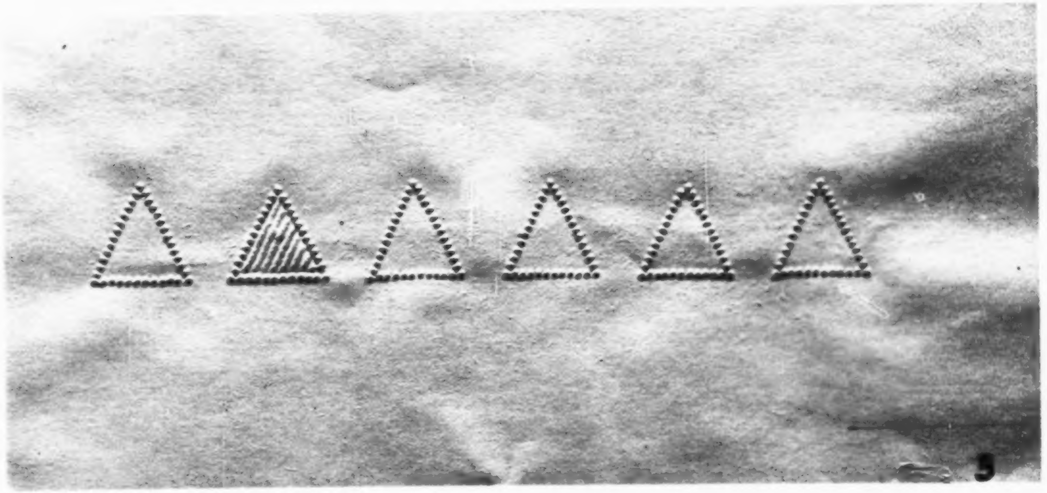
APPENDIX F

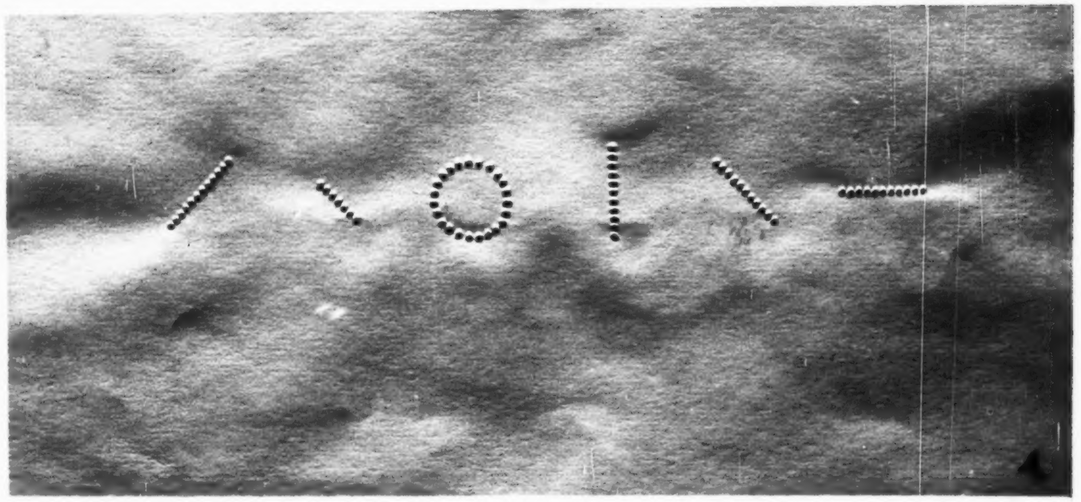
Since the BLAT plates were photographed before the final Score Sheet (Appendix E) was developed, the item numbers differ from those on the Score Sheet. The Table below provides the Score Sheet Item Numbers for the appropriate plates.

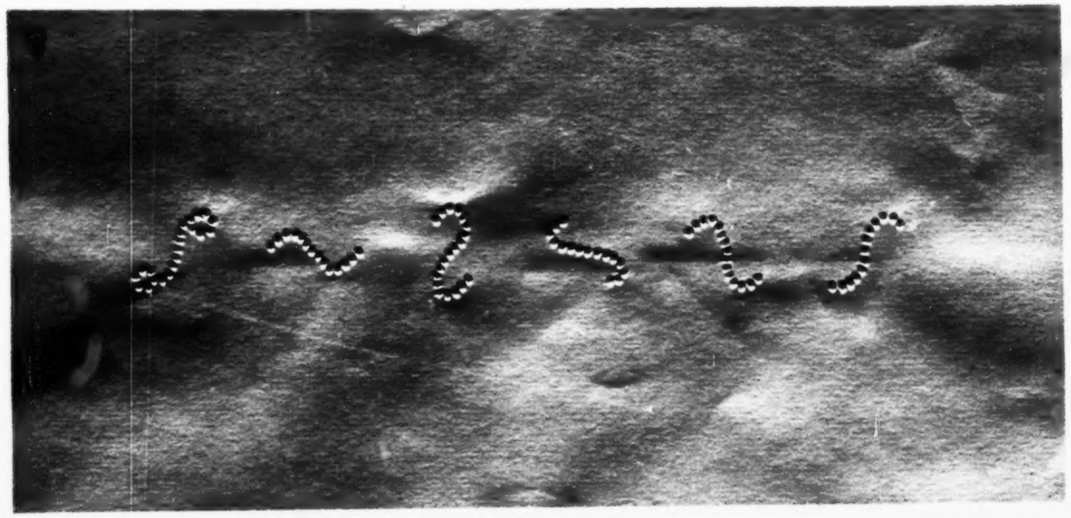
BLAT Response Sheet Item No.	Corresponding Plate Number (Appendix F)	BLAT Response Sheet Item No.	Corresponding Plate Number (Appendix F)
Tr	1	23	31
Tr	2	24	32
1	3	25	33
2	4	26	34
3	5	27	35
4	6	28	36
5	7	29	37
6	8	30	38
7	9	31	39
8	10	32	40
		33	41
Tr	11	34	42
Tr	12	35	43
9	13	36	44
10	14	37	45
11	15		
12	16	Tr	46
13	17	Tr	47
14	18	38	48
15	19	39	49
		40	50
Tr	20	41	51
Tr	21	42	52
16	22		
17	23	Tr	53
18	24	Tr	54
19	25	43	55
20	26	44	56
21	27	45	57
		46	58
Tr	28	47	59
Tr	29	48	60
22	30	49	61

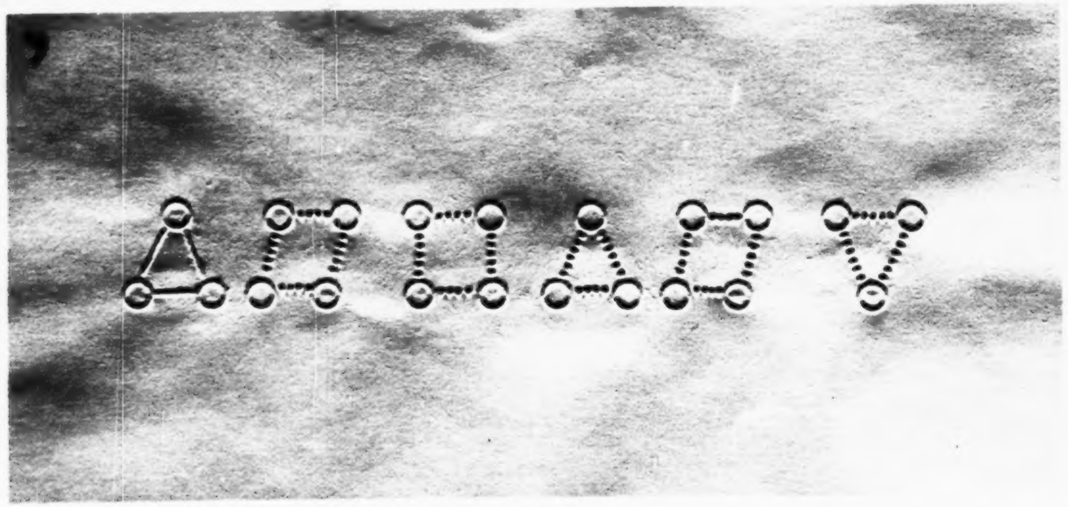

1 (m)


2 (m)


3


4

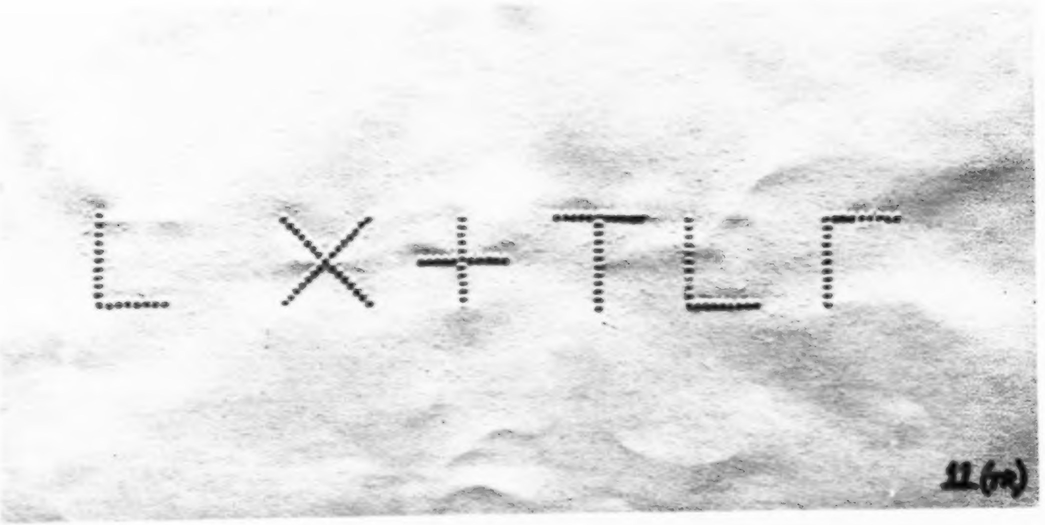




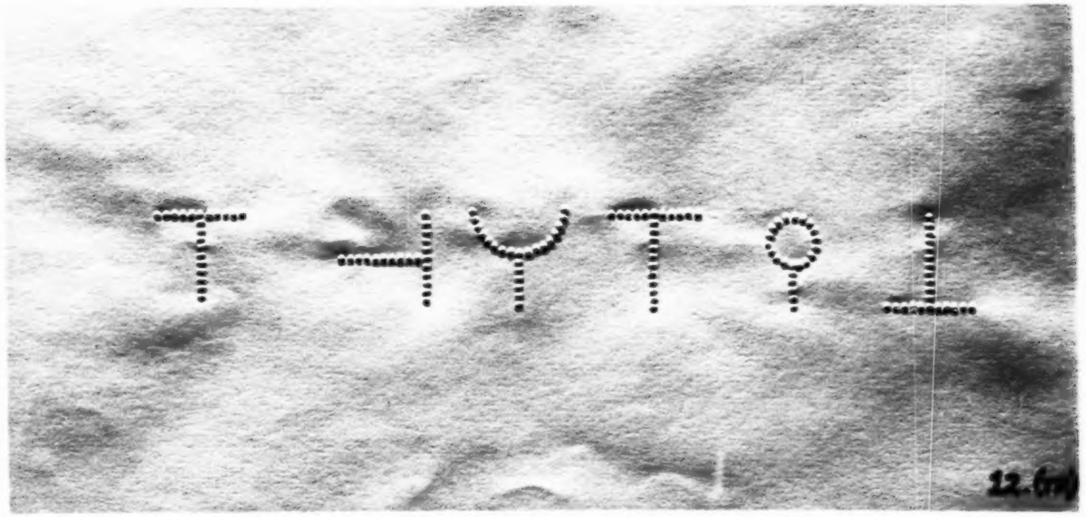
5

9.

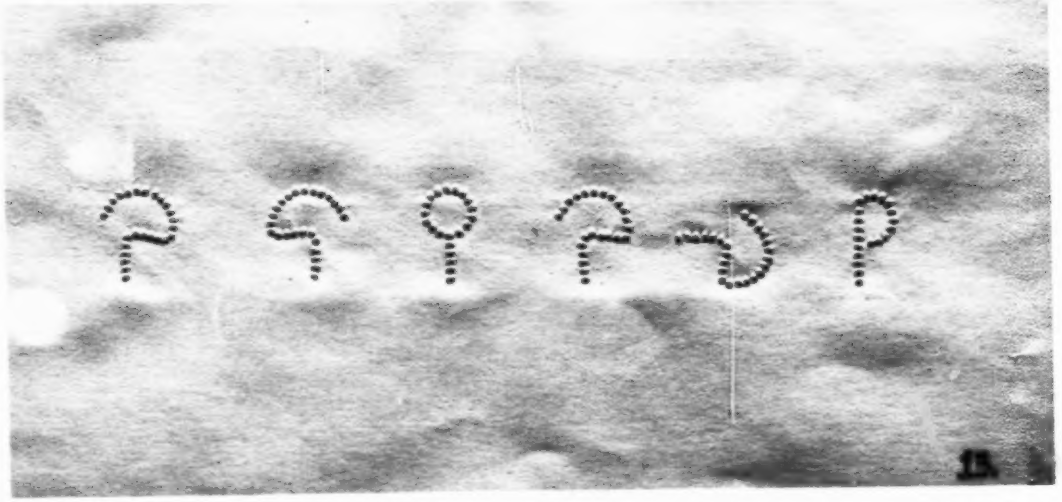
10.



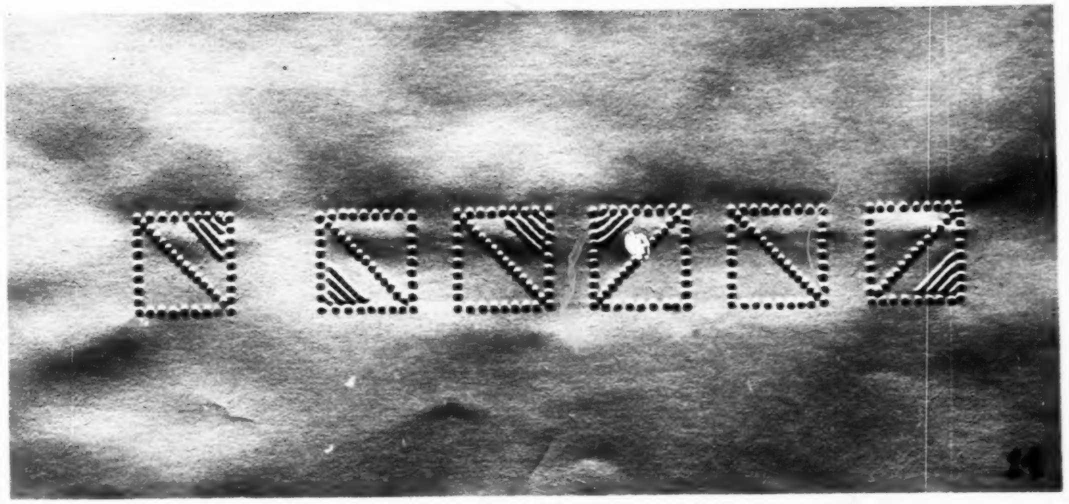
11.(m)



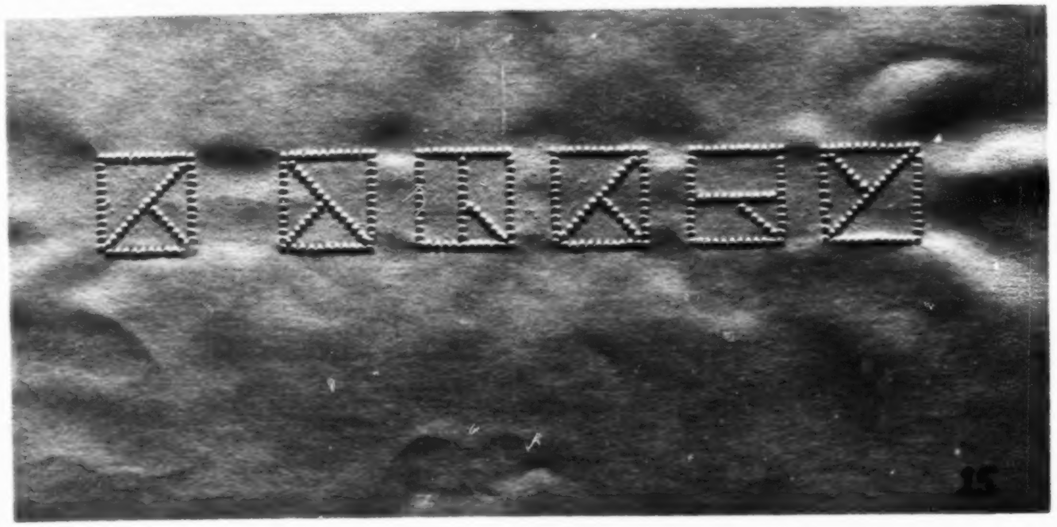
12.(m)



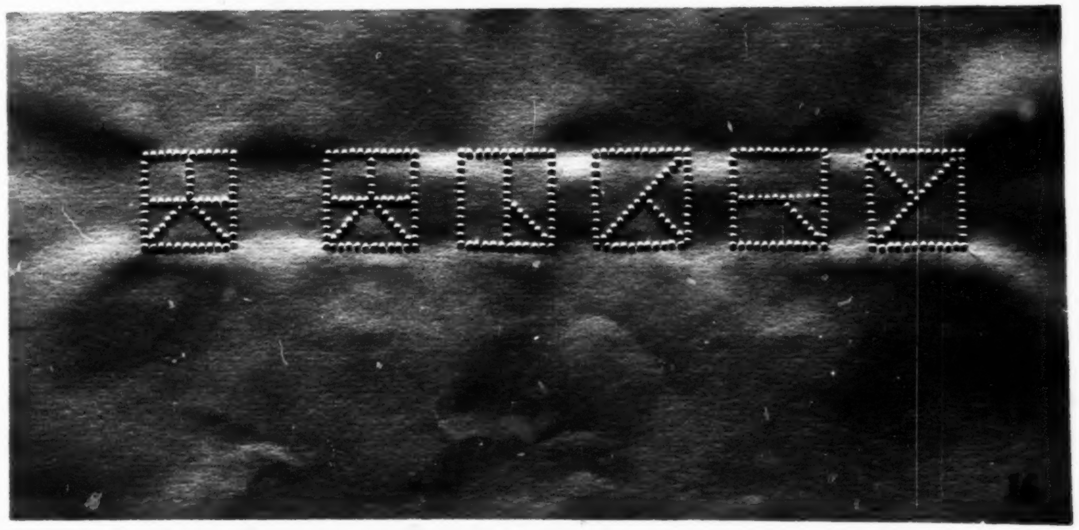
13.



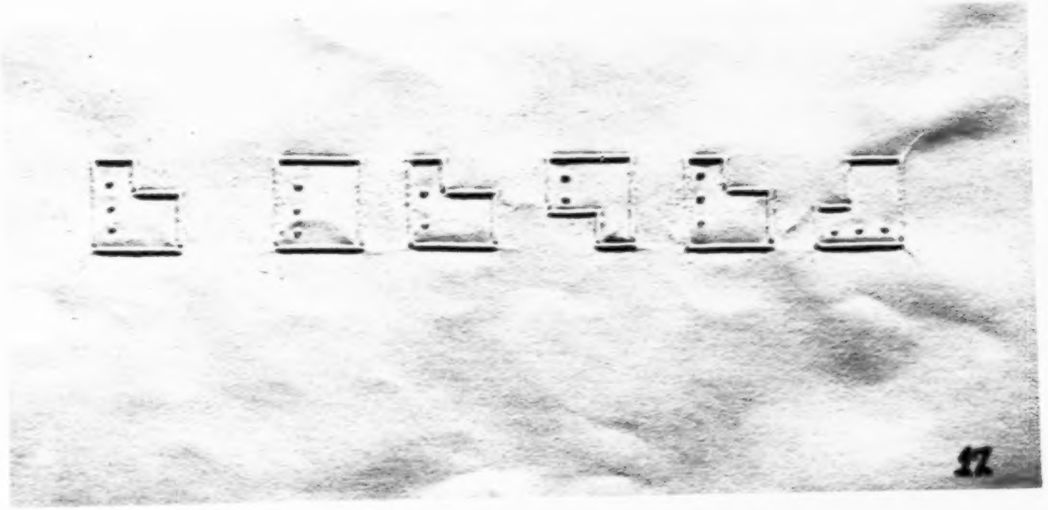
14.



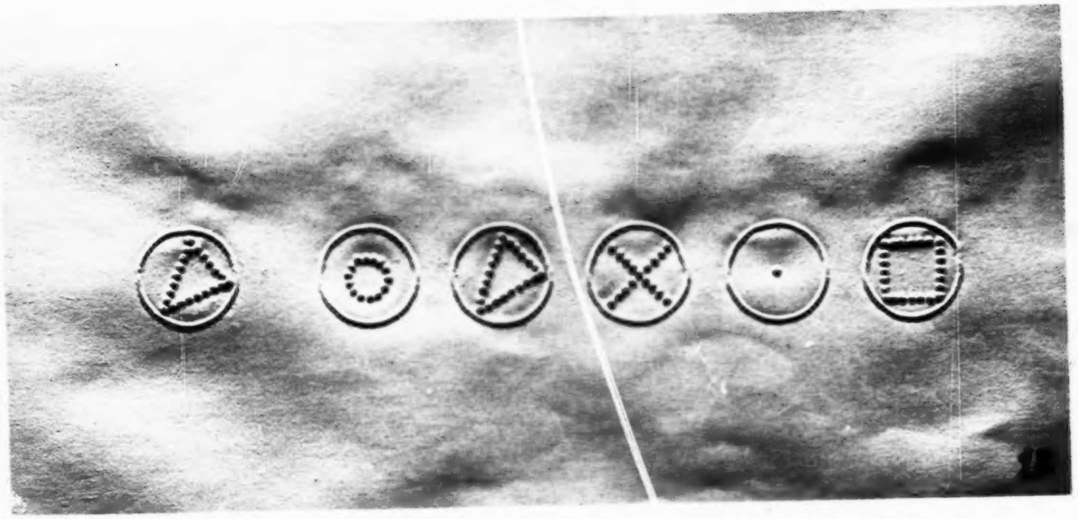
15.

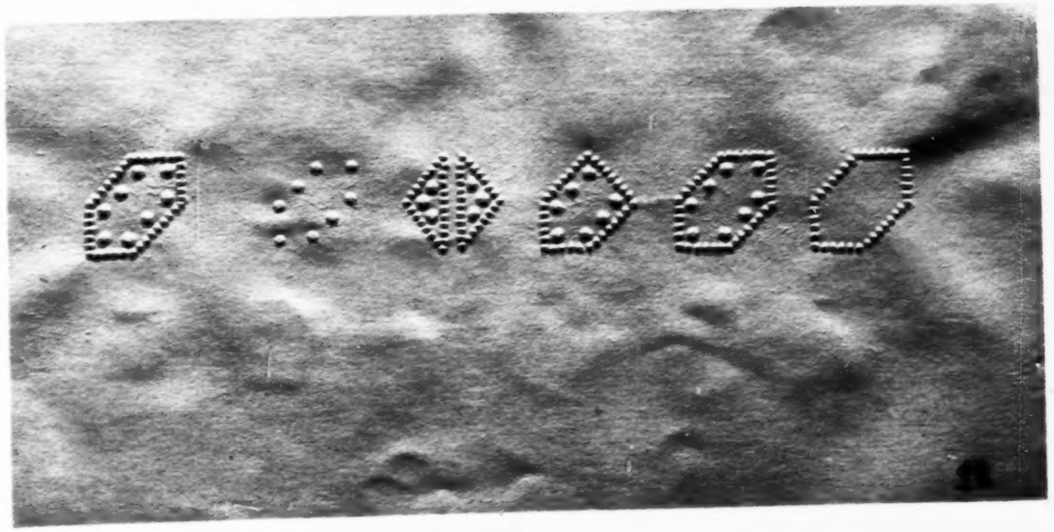


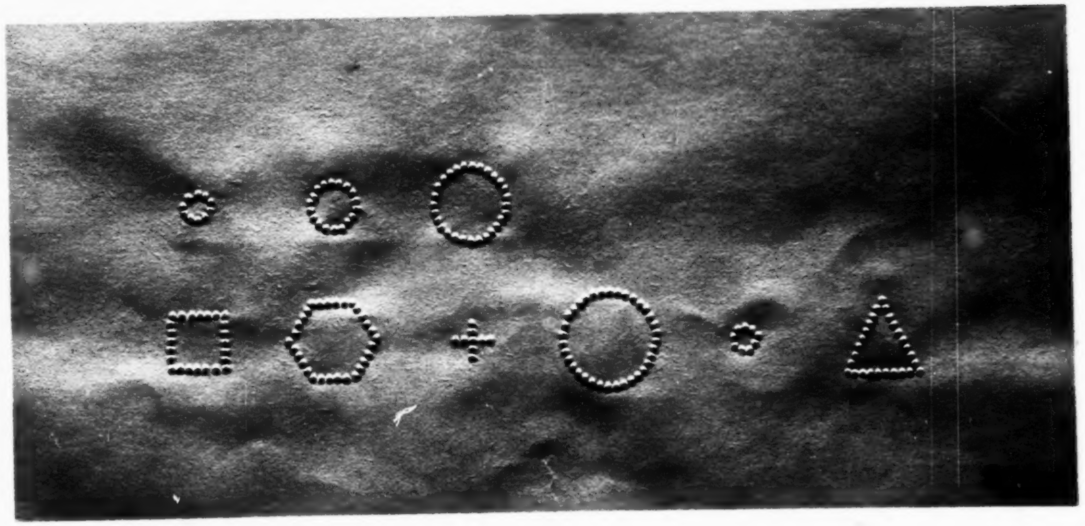
16.

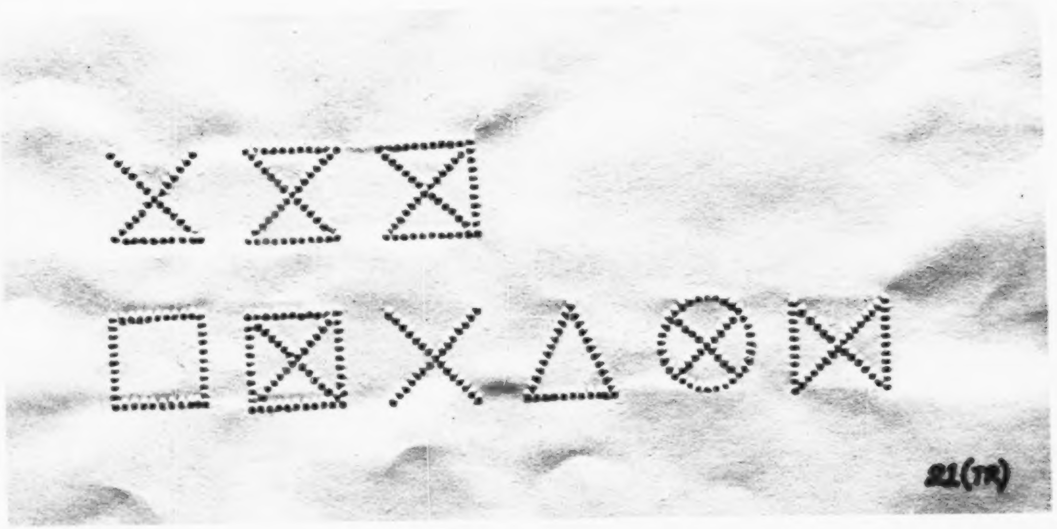


17

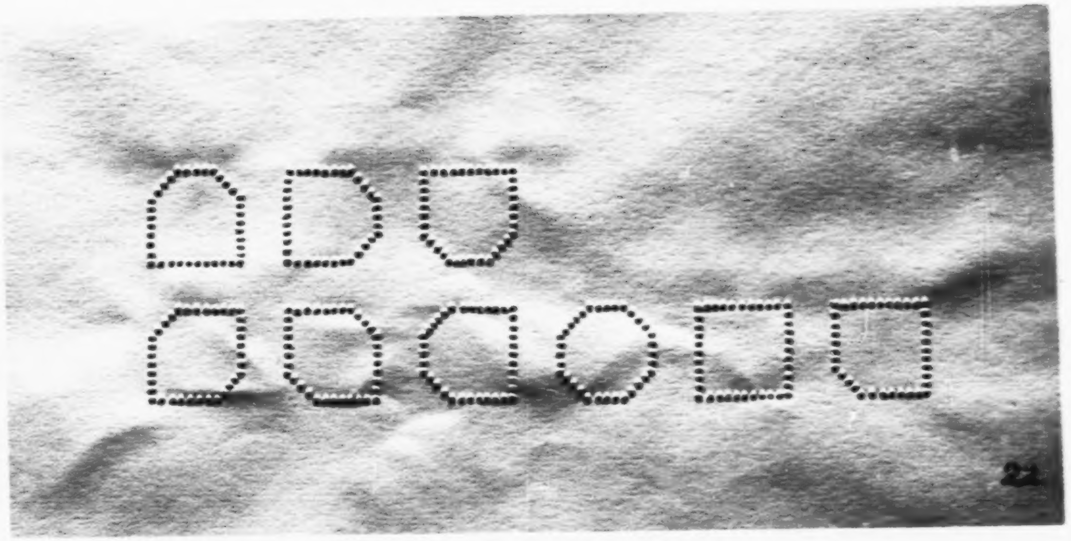




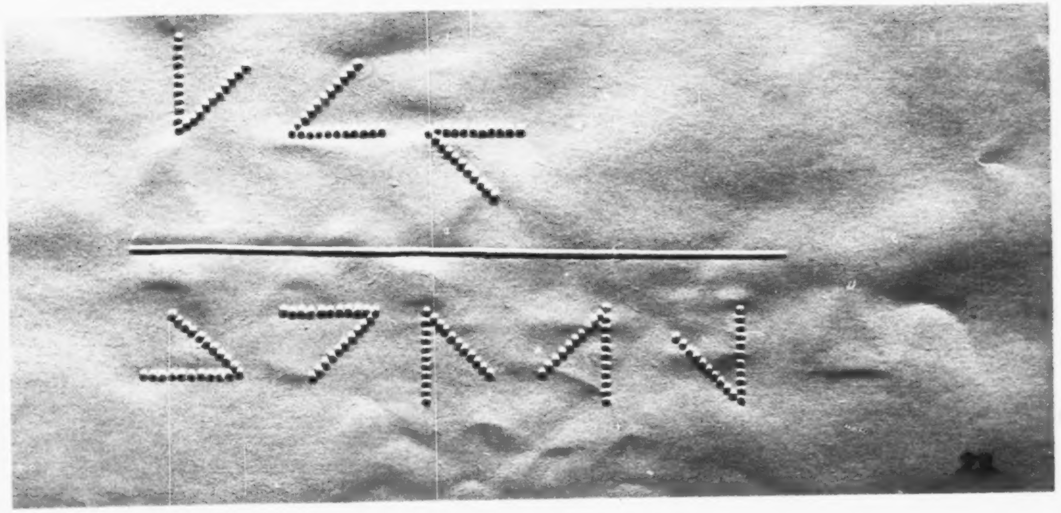




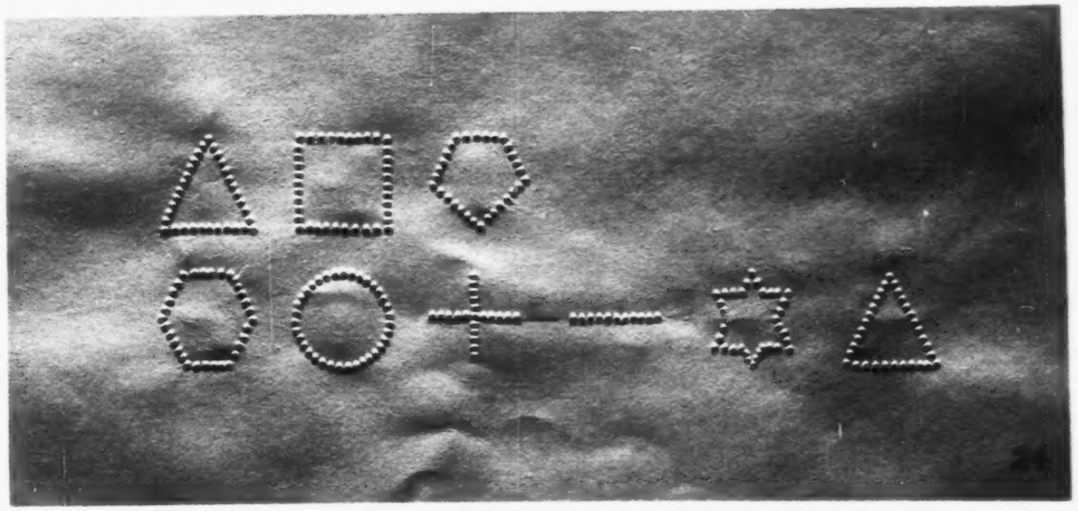
21(TR)



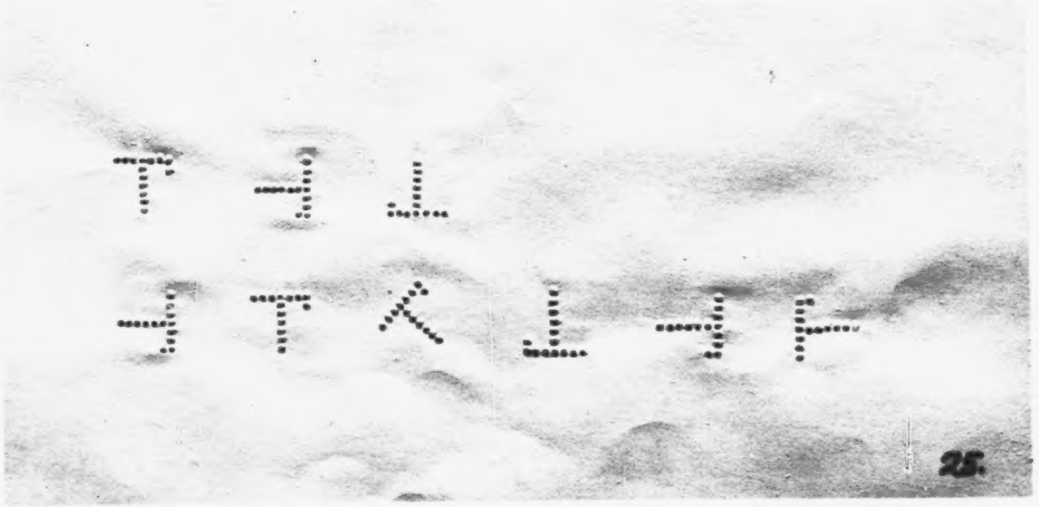
22



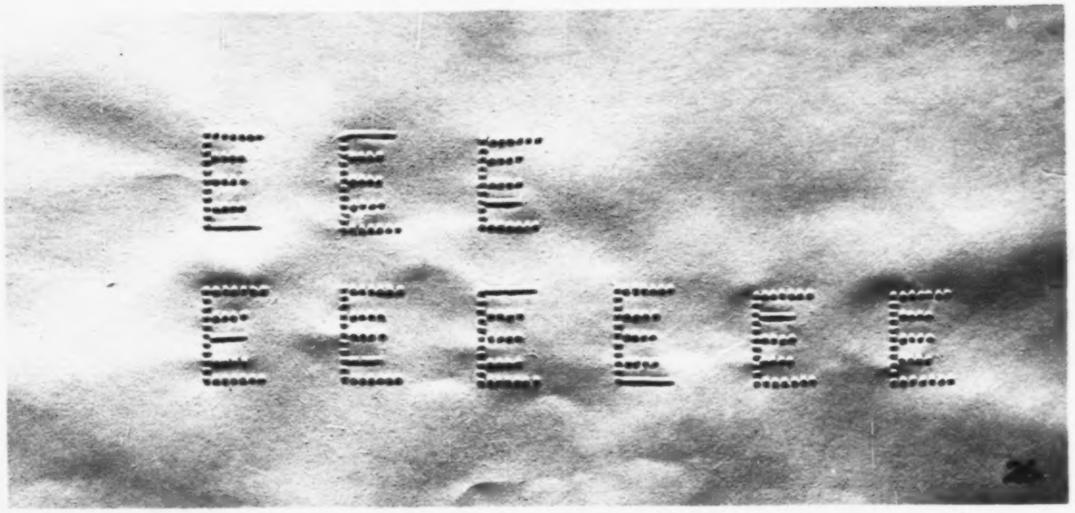
23



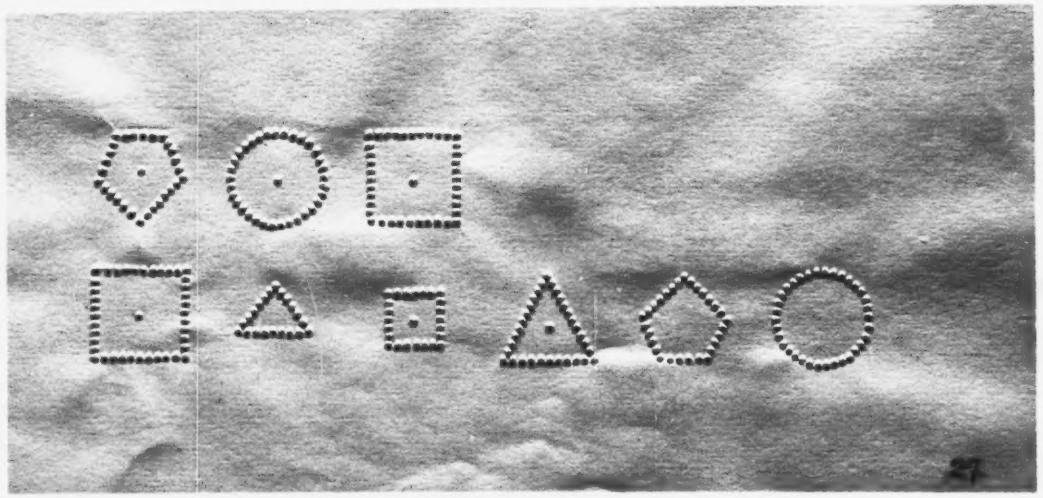
24



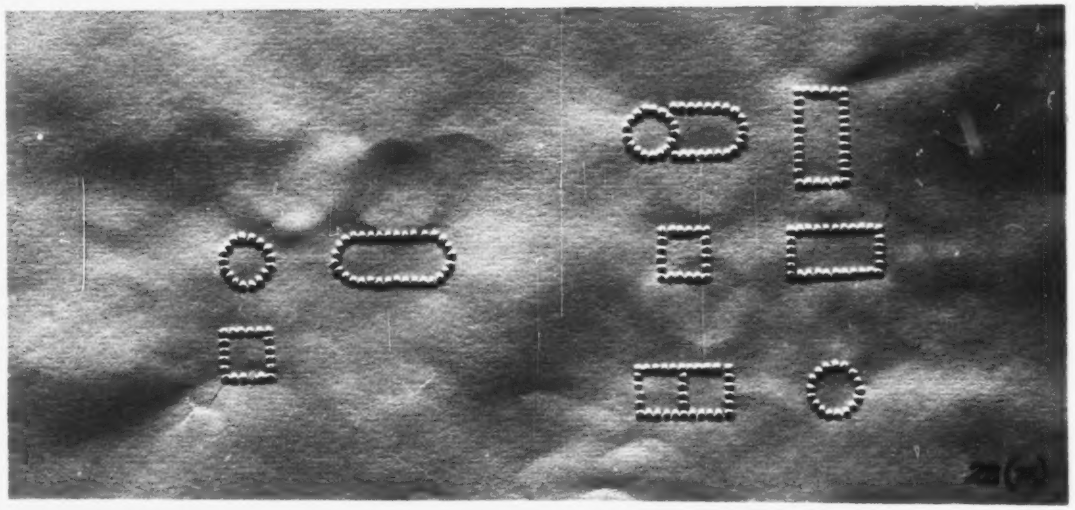
25.



26.

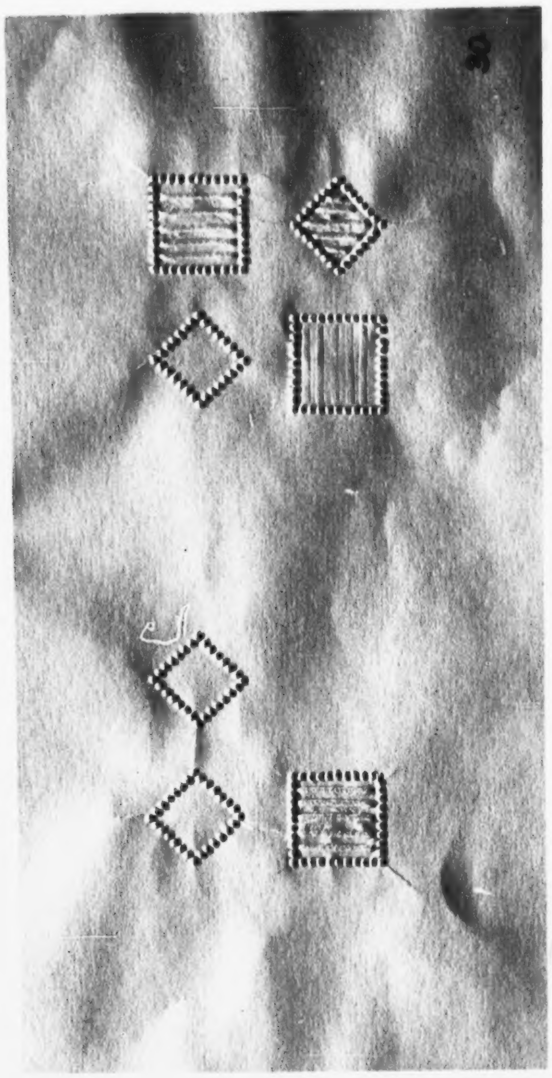


27.



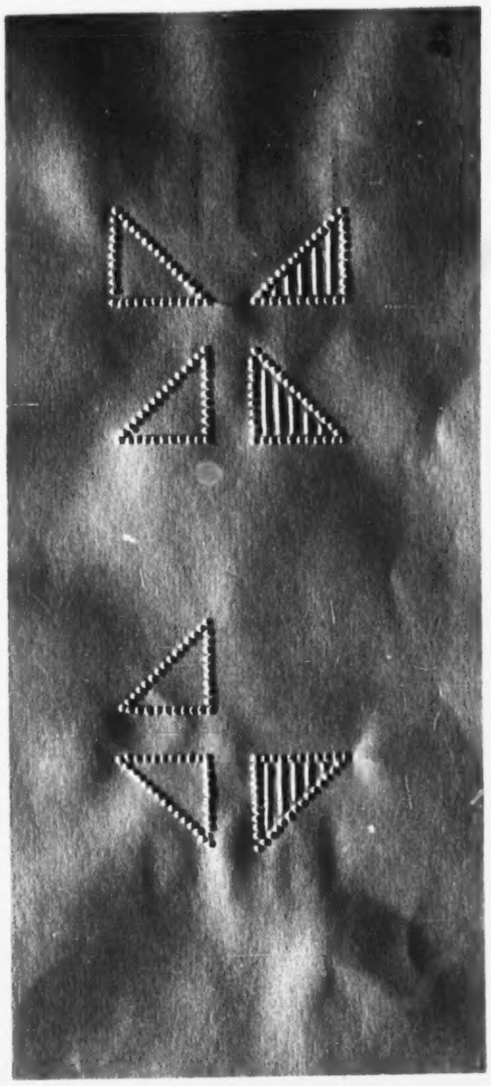
28(a)

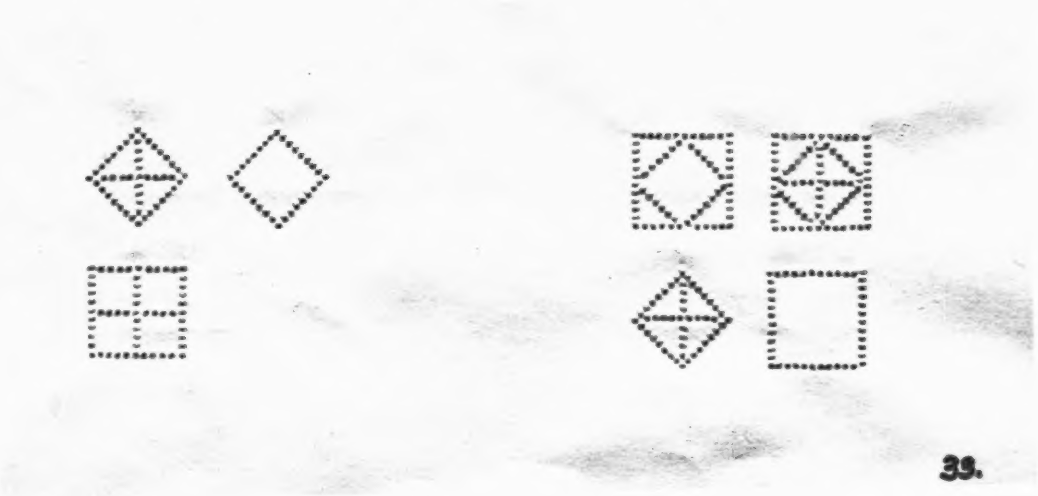
29.(m)



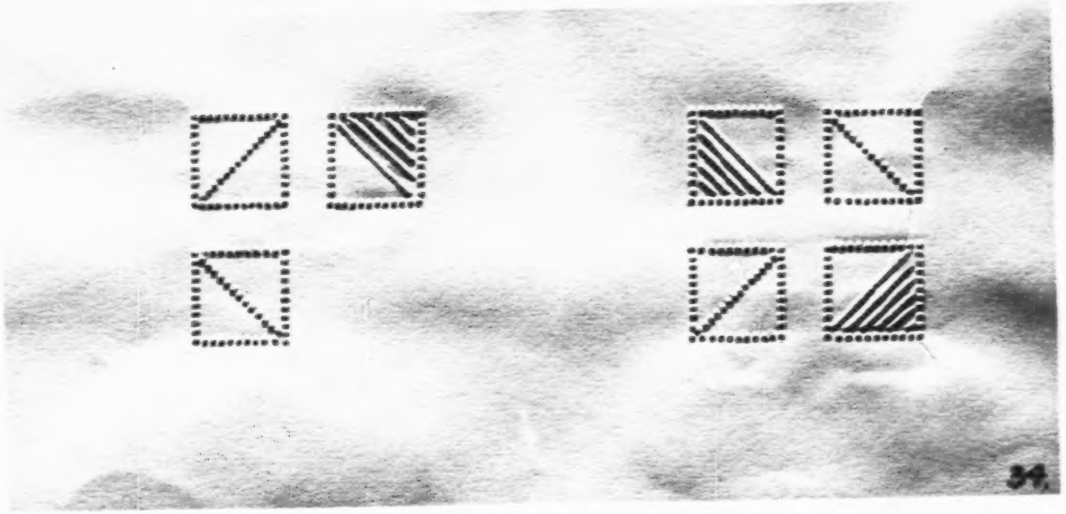
30.

31.

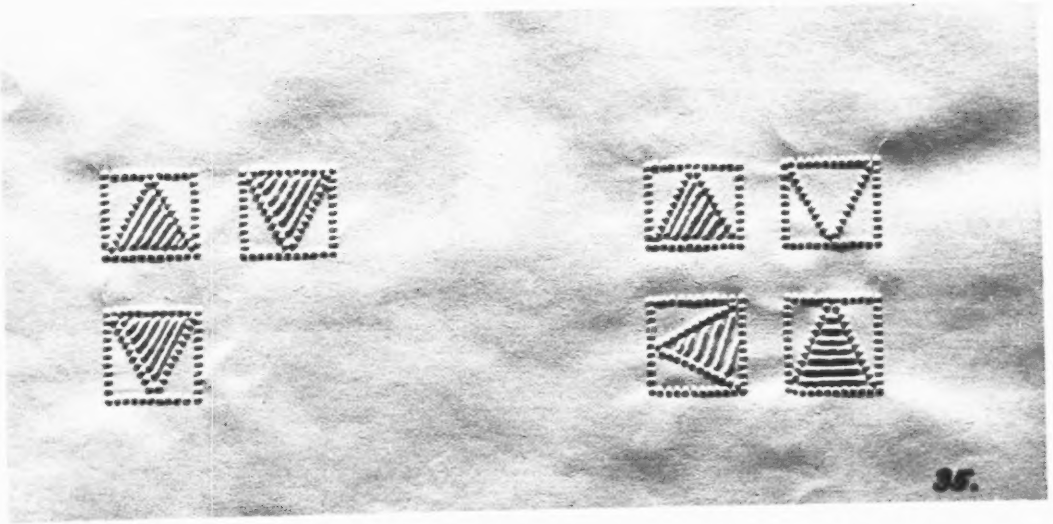




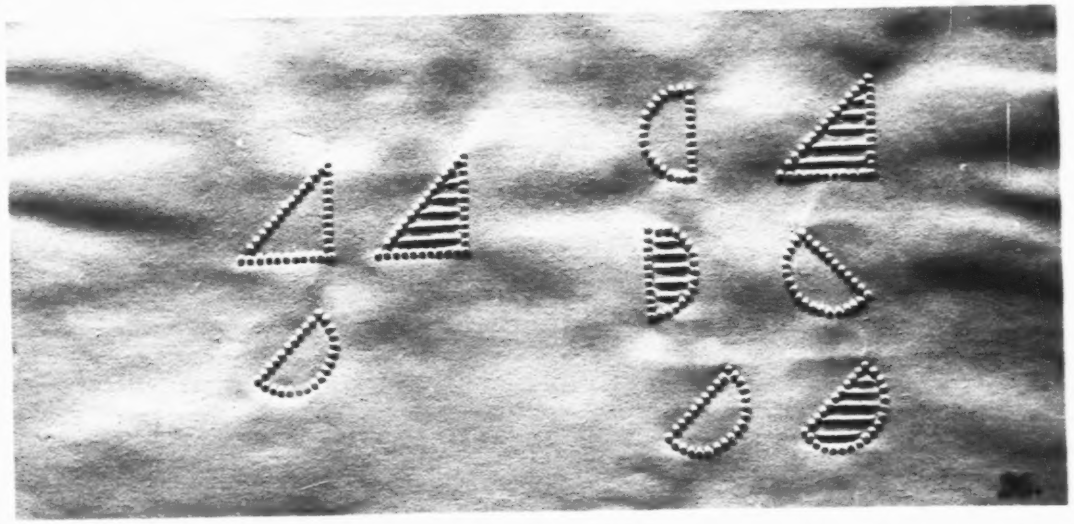
33.

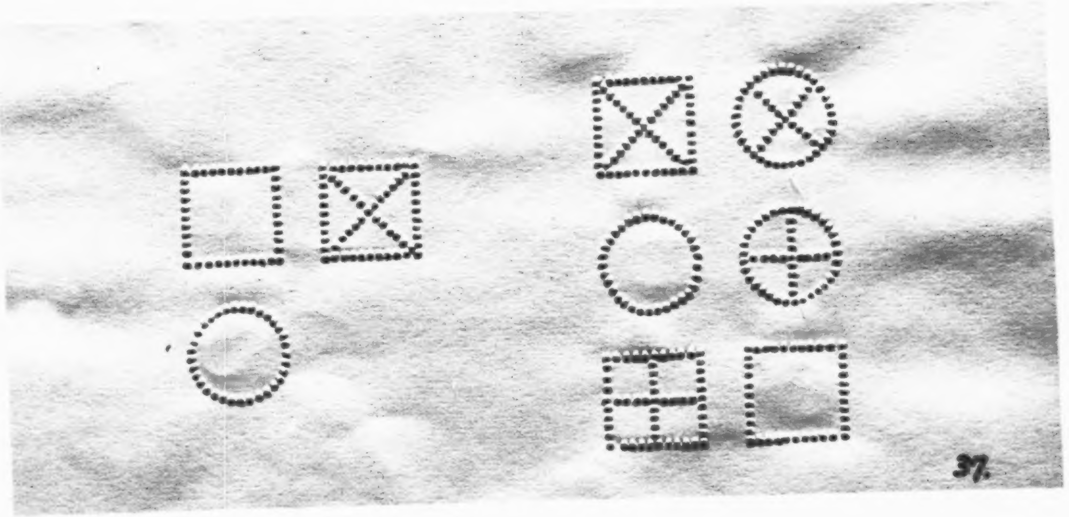


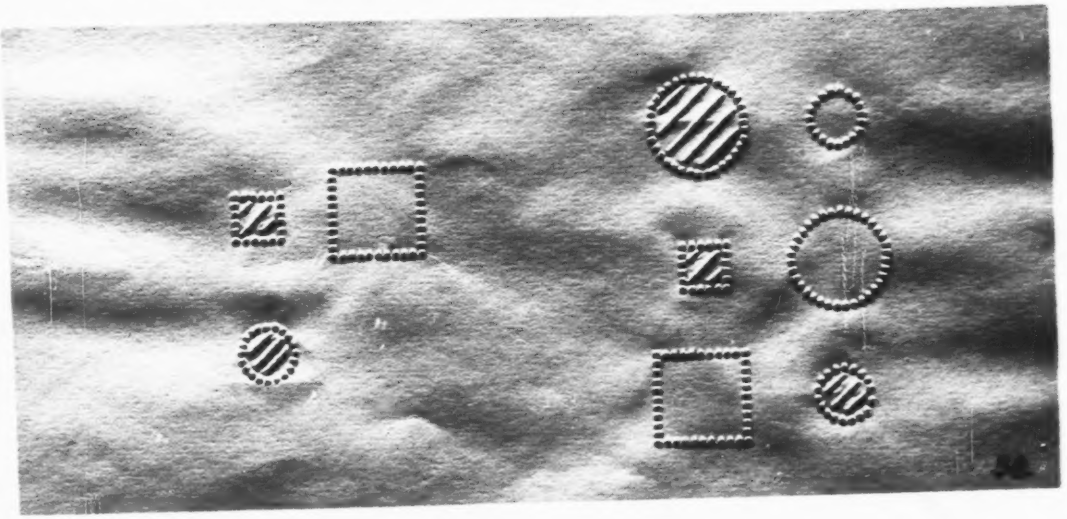
34.

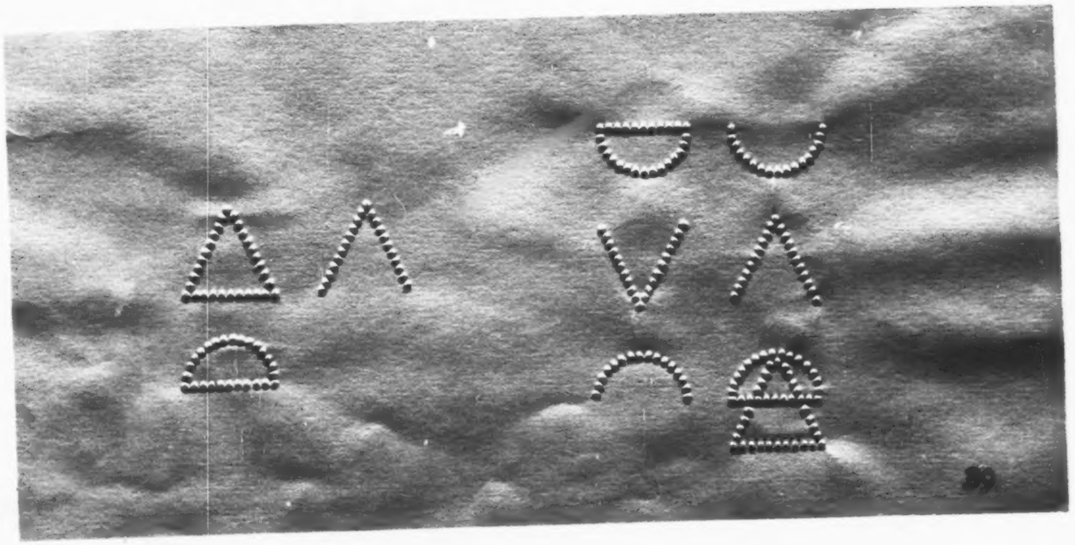


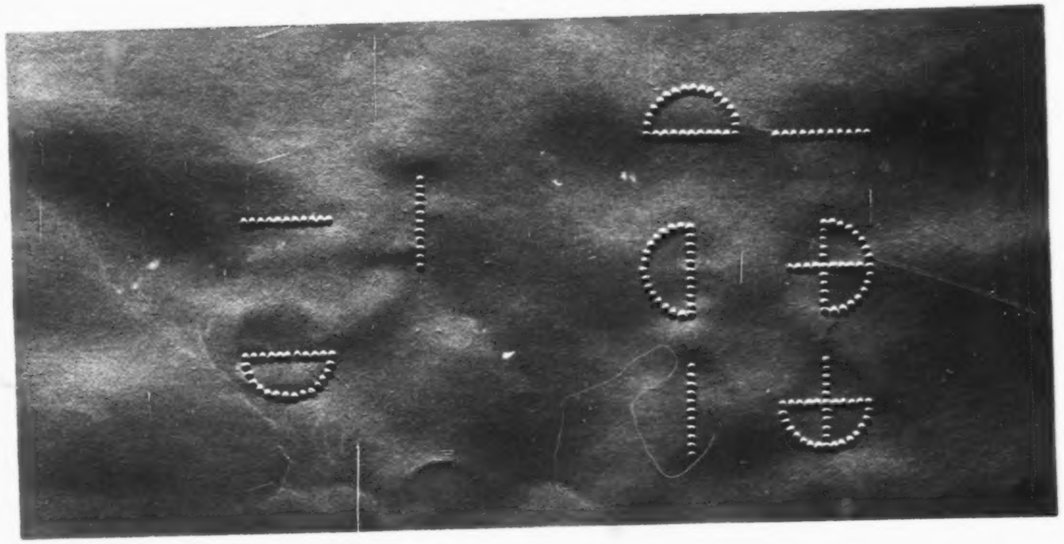
35.

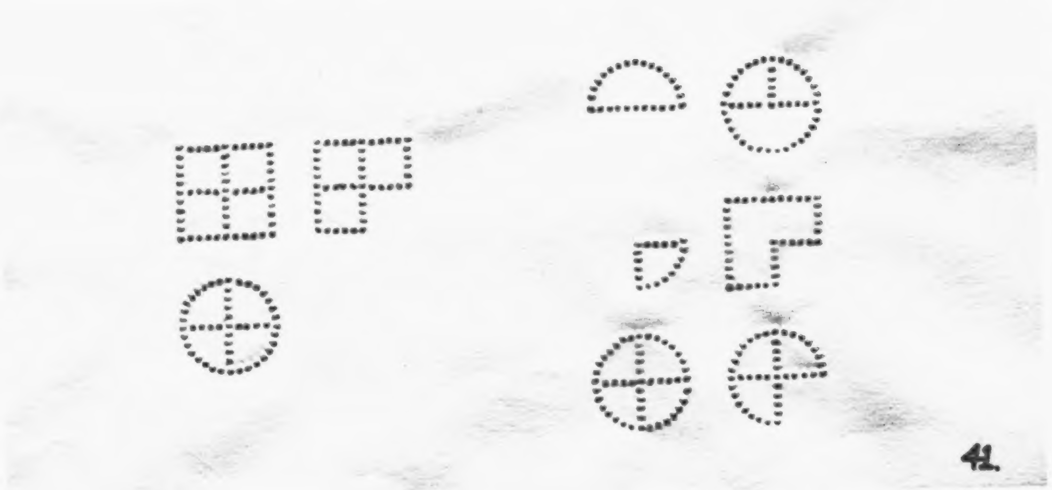



37.

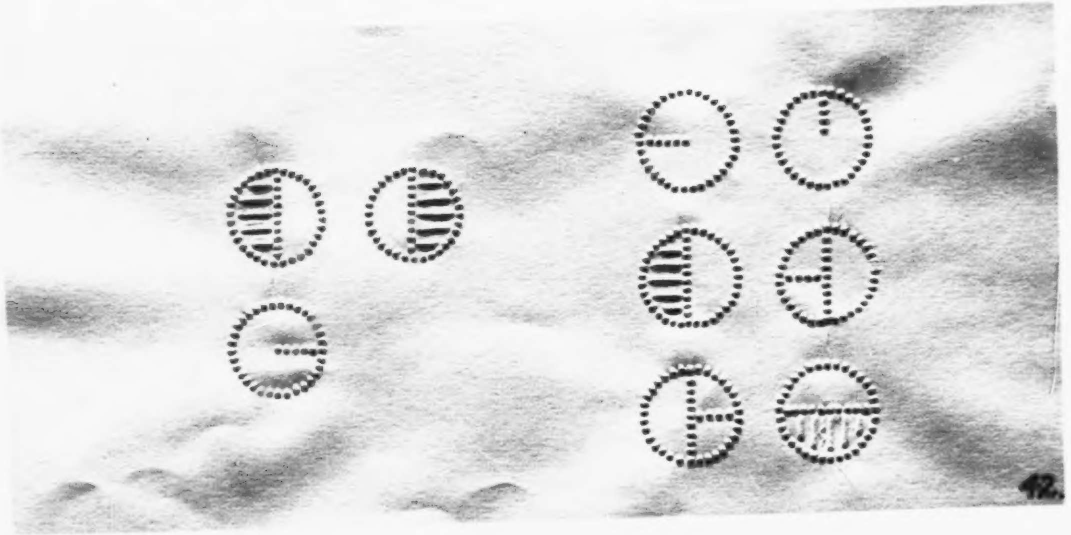

38.


39.

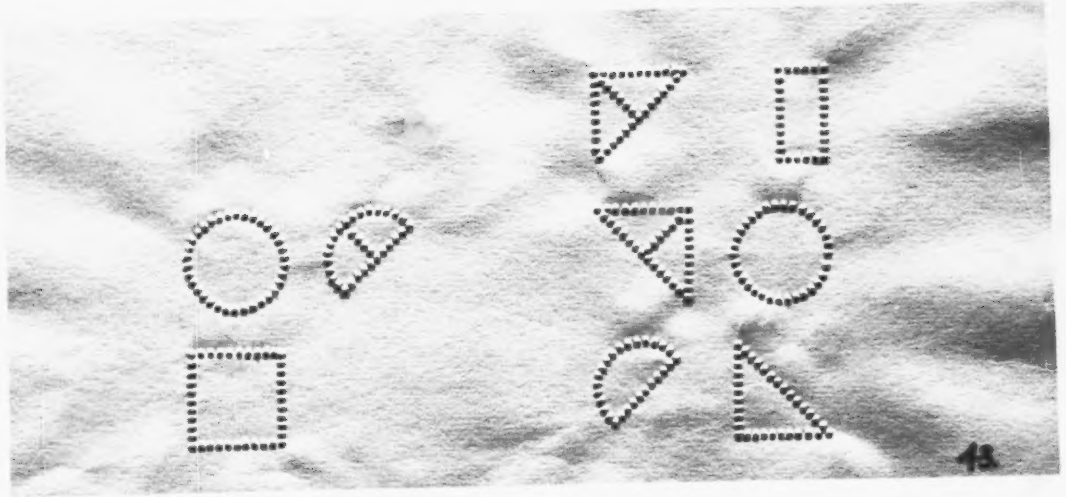




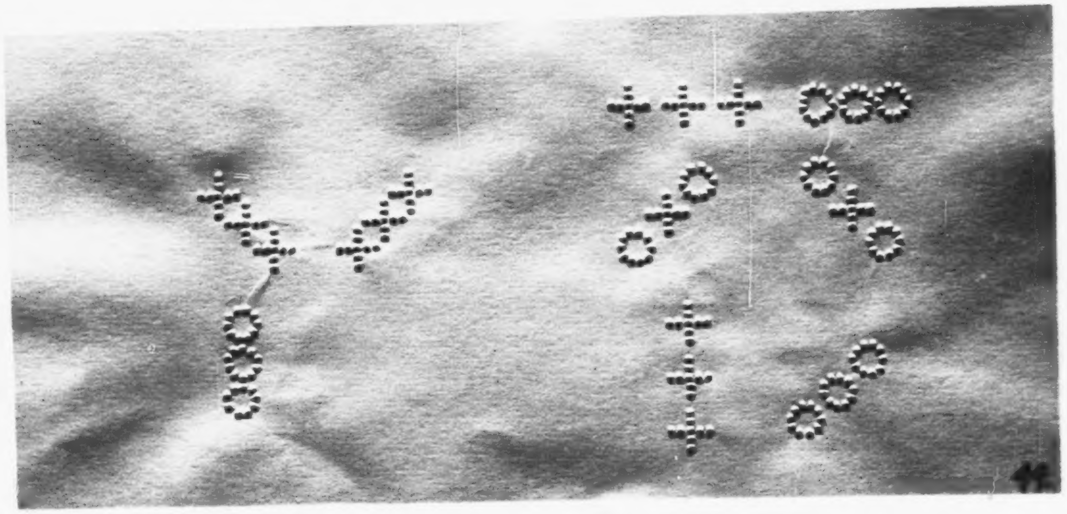
41.



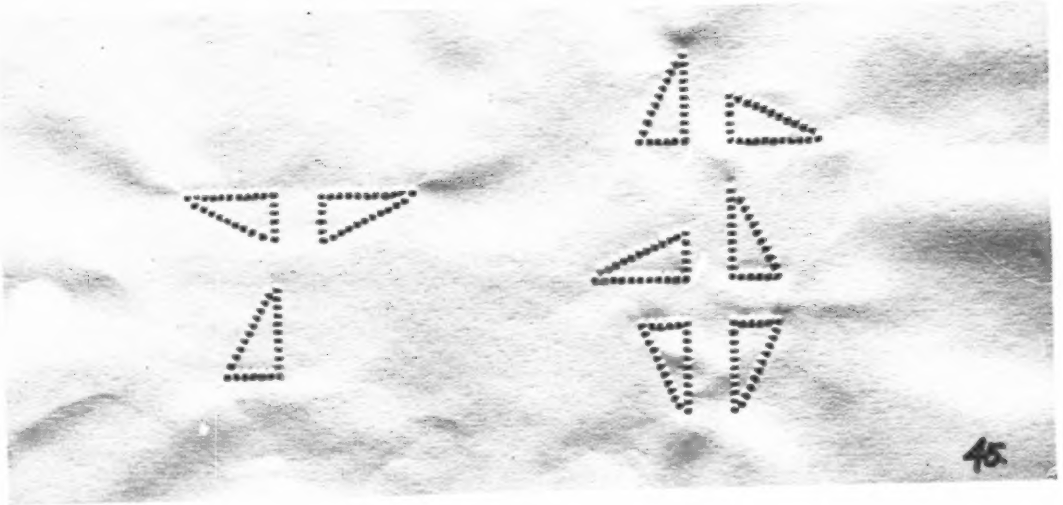
42.

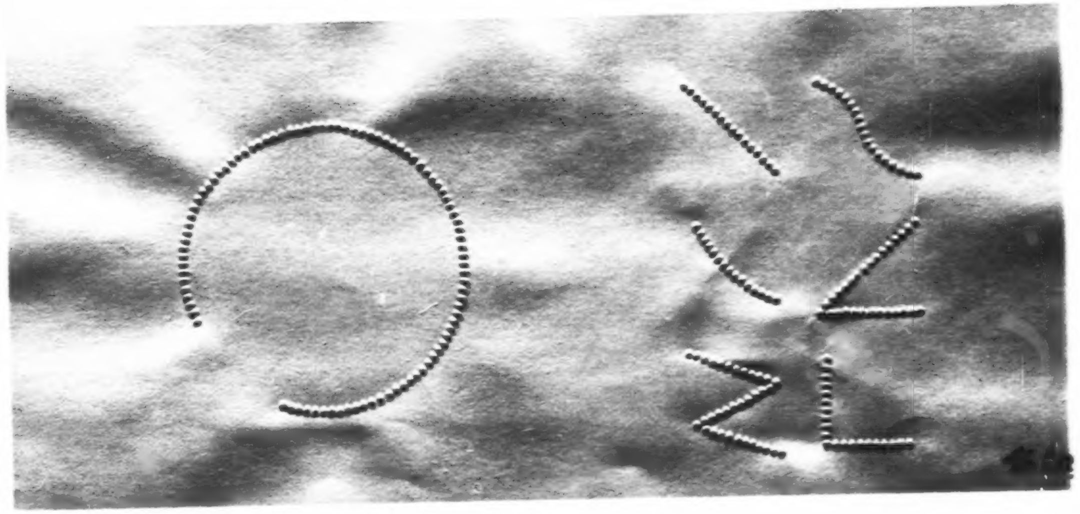


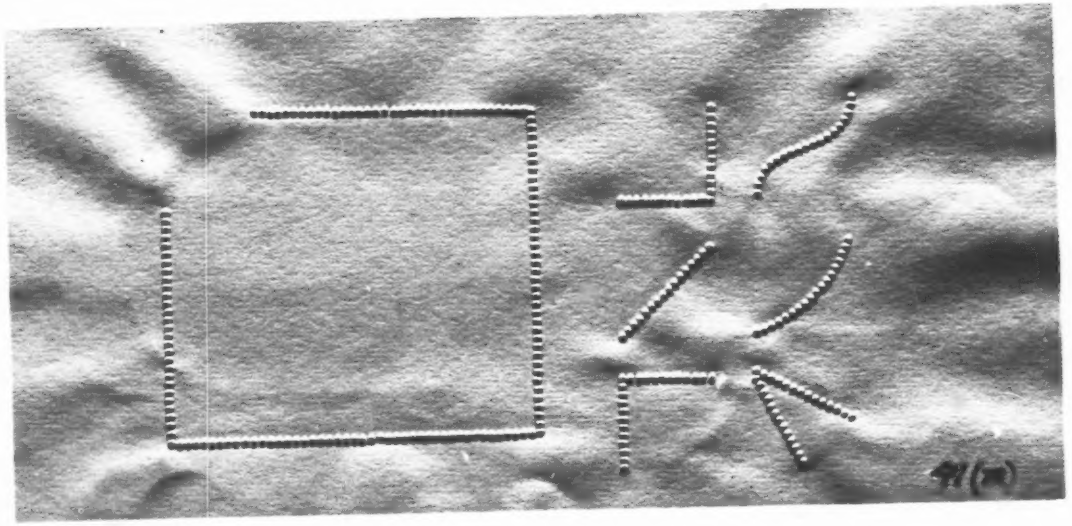
43.

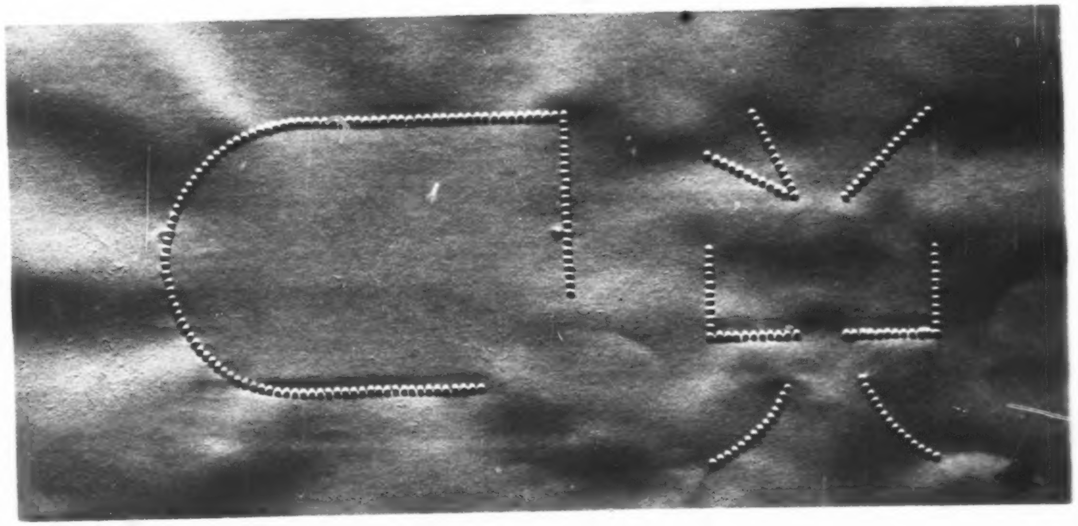


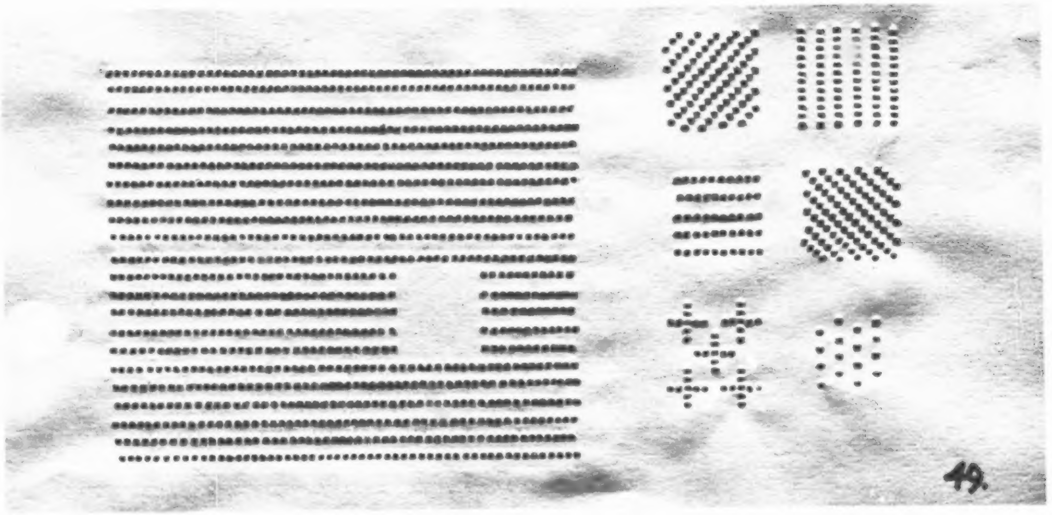
44.

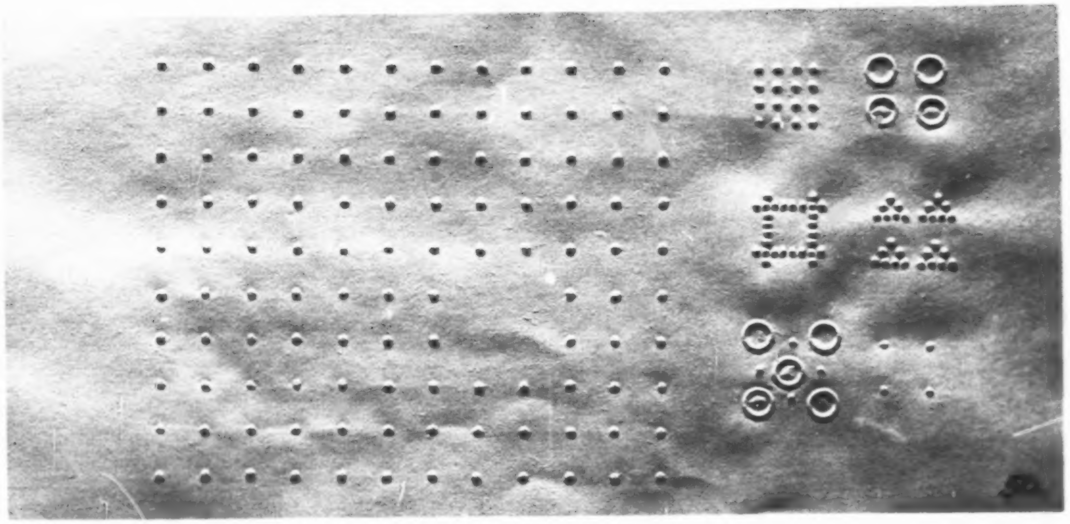

45.

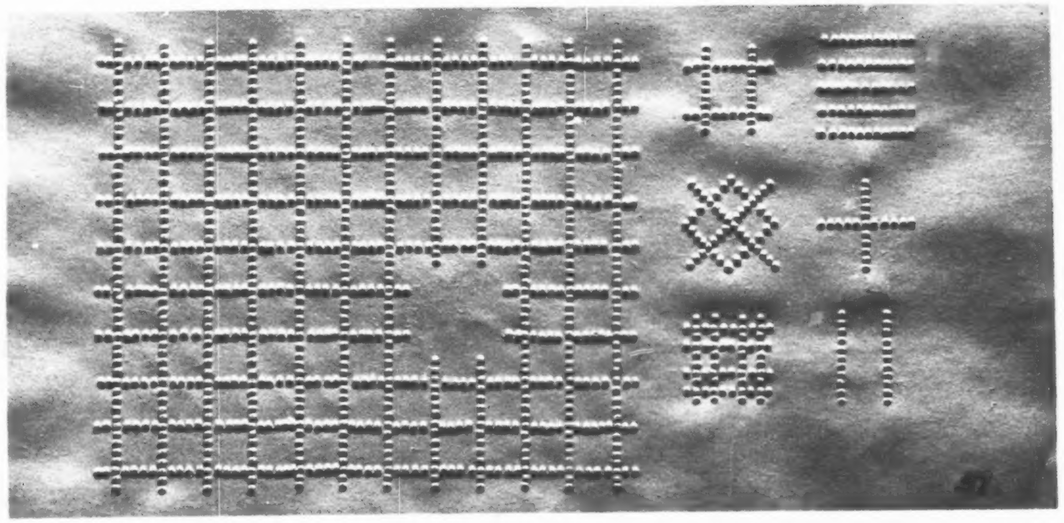


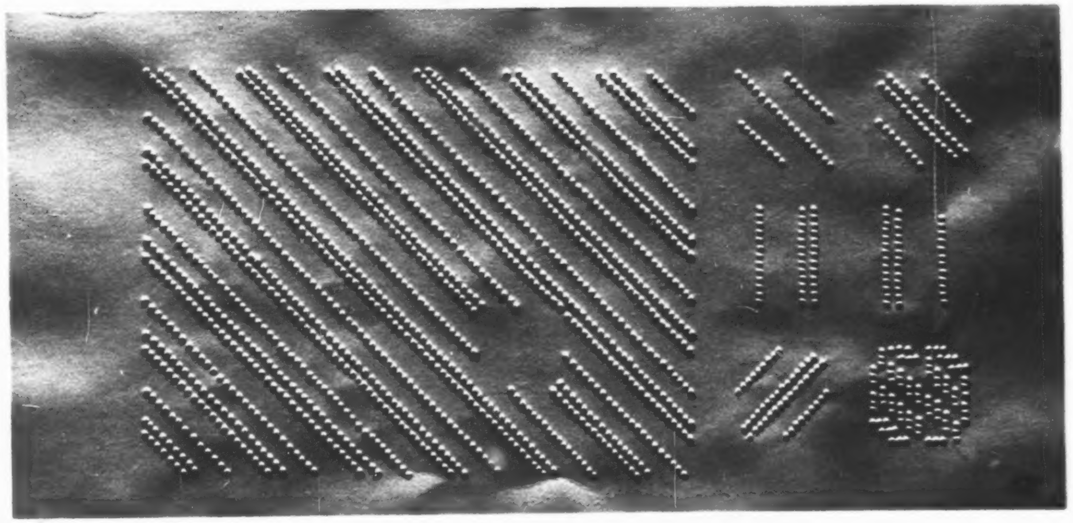

47(m)

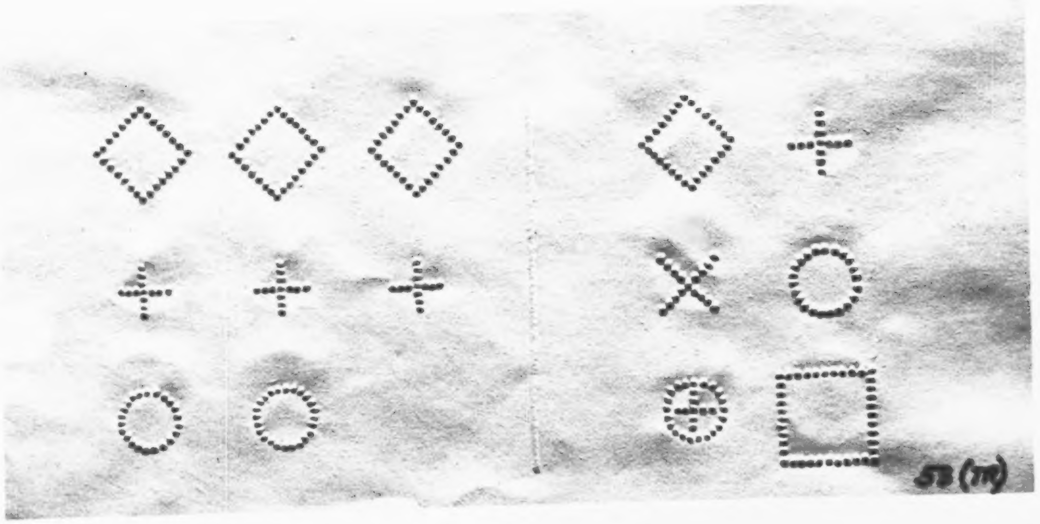


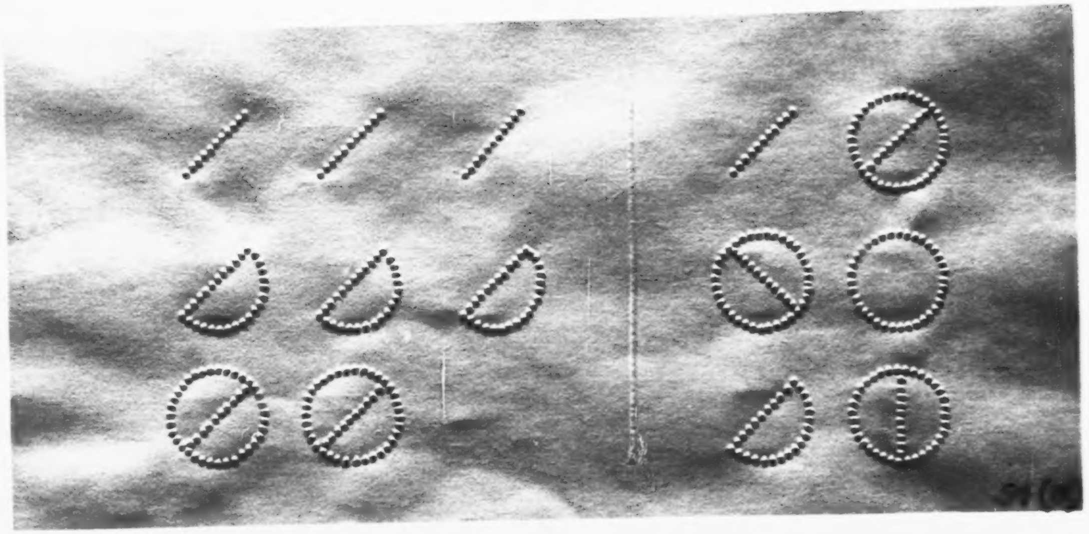

49.

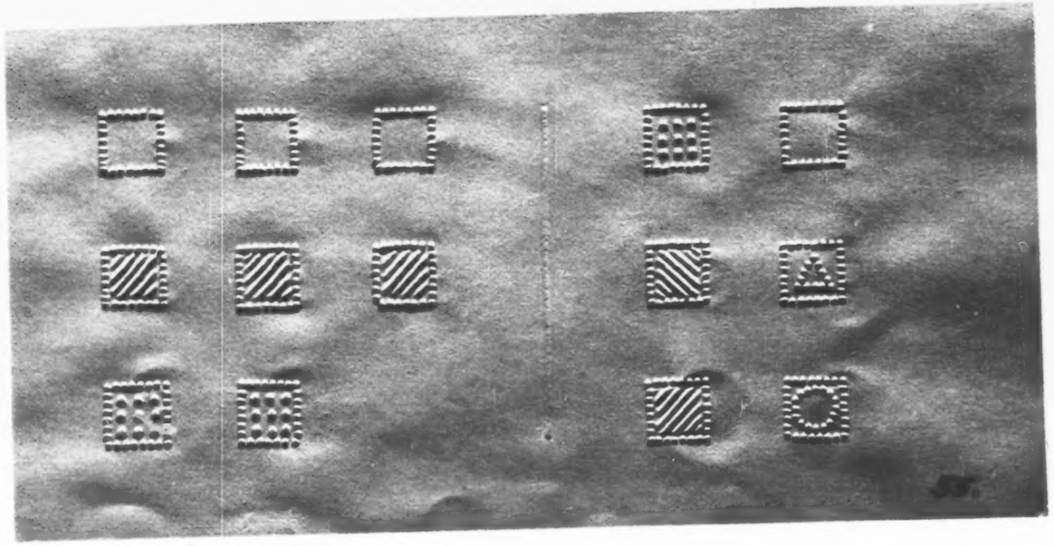


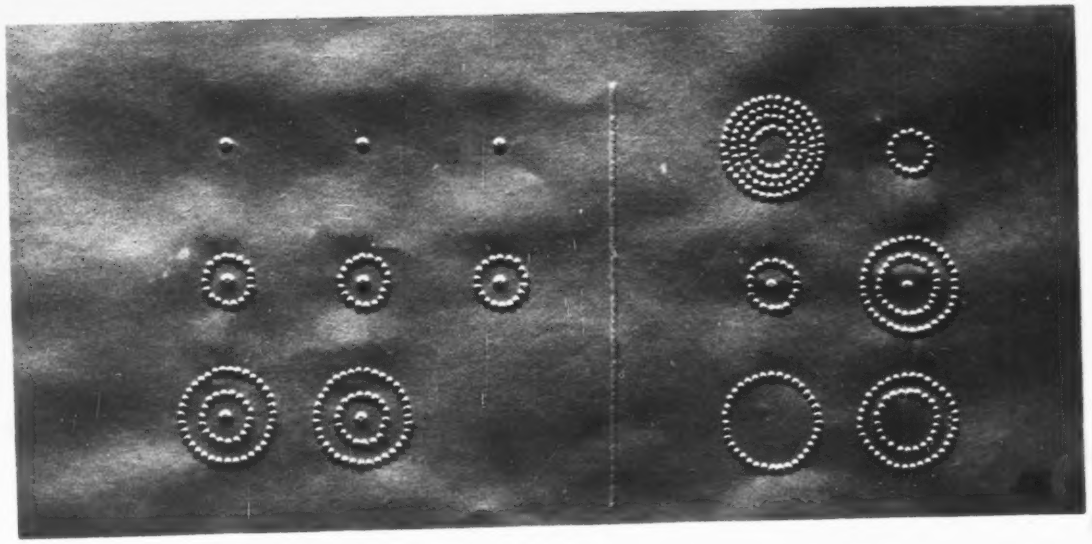


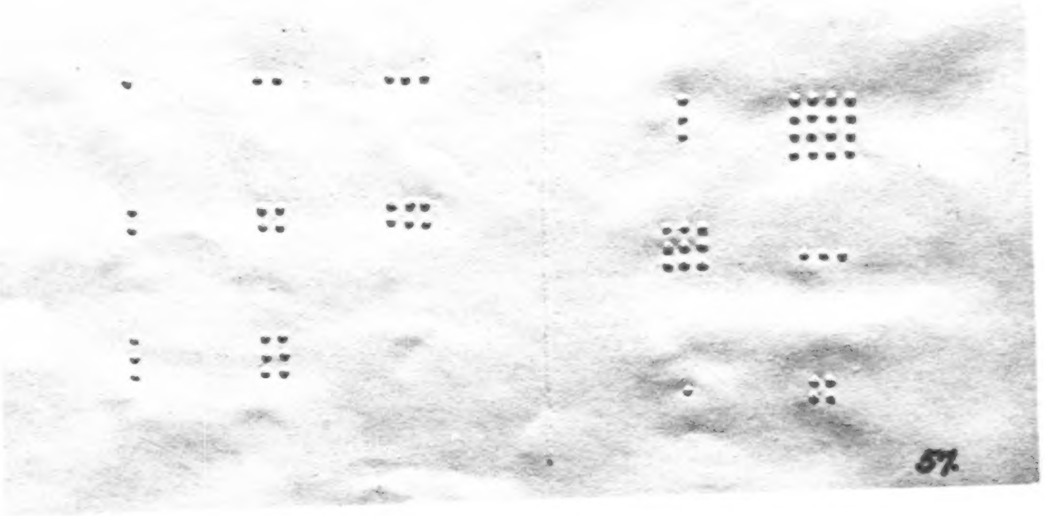



53 (m)


51 (c)


55




57